Commercial Building Code Academy

January 1, 2019

This meeting was cancelled due to the Holiday

SHAFTS, BARRIERS, PARTITION PENETRATIONS

Commercial Building Code Academy Feb 5, 2019

FACTS

- 1980 MGM Grand Hotel & Casino – Las Vegas
- 75 Deaths Smoke/Toxic Cases
- 1st Floor Restaurant Fire
- Majority of Deaths on Upper Floors
- **Faulty Smoke & Fire Dampers**

Q: *WHAT DOES THE 2018 NCMC TELL US ABOUT PENETRATIONS OF RATED ASSEMBLIES?*

A: **302.2 Penetrations of floor/ceiling assemblies and fire-resistance-rated assemblies.** Penetrations of floor/ceiling assemblies and assemblies required to have a fire-resistance rating shall be protected in accordance with Chapter 7 of the *International Building Code*.

Q: *WHAT DOES THAT MEAN?*

A: It means the Mechanical Inspector and Building Inspector should be working **together** to make sure duct and air transfer penetrations are properly located in fire-resistance rated assemblies.

SECTION 717 OF THE 2018 NCBC TELLS US HOW TO PROTECT THESE PENETRATIONS

SECTION 717
DUCTS AND AIR TRANSFER OPENINGS

717.1 General. The provisions of this section shall govern the protection of duct penetrations and air transfer openings in assemblies required to be protected and duct penetrations in nonfire-resistance-rated floor assemblies.

MORE SPECIFICALLY, **SECTION 717.5** TELLS US WHERE PROTECTION IS REQUIRED BASED ON THE TYPE OF FIRE-RESISTANT RATED ASSEMBLY BEING PENETRATED

717.5 Where required. *Fire, dampers, smoke dampers, combination fire/smoke dampers, ceiling radiation dampers* and *corridor dampers* shall be provided at the locations prescribed in Sections 717.5.1 through 717.5.7 and 717.6. Where an assembly is required to have both *fire dampers* and *smoke dampers*, *combination fire/smoke dampers* or a *fire damper* and a *smoke damper* shall be provided.

Definitions from NCBC

[BF] CEILING RADIATION DAMPER. A *listed* device installed in a ceiling membrane of a fire-resistance-rated floor/ceiling or roof/ceiling assembly to limit automatically the radiative heat transfer through an air inlet/outlet opening.

[BF] COMBINATION FIRE/SMOKE DAMPER. A *listed* device installed in ducts and air transfer openings designed to close automatically upon the detection of heat and resist the passage of flame and smoke. The device is installed to operate automatically, be controlled by a smoke detection system, and where required, is capable of being positioned from a fire command center.

DAMPER. A manually or automatically controlled device to regulate draft or the rate of flow of air or *combustion* gases.

Volume damper. A device that, where installed, will restrict, retard or direct the flow of air in a duct, or the products of *combustion* in a heat-producing *appliance*, its vent connector, vent or *chimney* therefrom.

[BF] FIRE DAMPER. A *listed* device installed in ducts and air transfer openings designed to close automatically upon detection of heat and to restrict the passage of flame. Fire dampers are classified for use in either static systems that will automatically shut down in the event of a fire, or in dynamic systems that continue to operate during a fire. A dynamic fire damper is tested and rated for closure under elevated temperature airflow.

[BF] SMOKE DAMPER. A *listed* device installed in ducts and air transfer openings designed to resist the passage of smoke. The device is installed to operate automatically, controlled by a smoke detection system, and where required, is capable of being positioned from a fire command center.

717.3.2 Damper rating. *Damper* ratings shall be in accordance with Sections 717.3.2.1 through 717.3.2.4.

717.3.2.1 Fire damper ratings. *Fire dampers* shall have the minimum *fire protection rating* specified in Table 717.3.2.1 for the type of penetration.

TABLE 717.3.2.1
FIRE DAMPER RATING

TYPE OF PENETRATION	MINIMUM DAMPER RATING (hours)
Less than 3-hour fire-resistance-rated assemblies	1.5
3-hour or greater fire-resistance-rated assemblies	3

717.3.2.2 Smoke damper ratings. *Smoke damper* leakage ratings shall be Class I or II. Elevated temperature ratings shall be not less than 250°F (121°C).

717.3.2.3 Combination fire/smoke damper ratings. *Combination fire/smoke dampers* shall have the minimum *fire protection rating* specified for *fire dampers* in Table 717.3.2.1 for the type of penetration and shall have a minimum *smoke damper* rating as specified in Section 717.3.2.2.

717.3.2.4 Corridor damper ratings. *Corridor dampers* shall have the following minimum ratings:

1. One hour *fire-resistance rating*.
2. Class I or II leakage rating as specified in Section 717.3.2.2.

717.3.2.2 Smoke damper ratings.
Smoke damper leakage ratings shall be Class I or II. Elevated temperature ratings shall be not less than 250°F (121°C).

717.3.2.4 Corridor damper ratings.
Corridor dampers shall have the following minimum ratings:

1. One hour *fire-resistance rating*.
2. Class I or II leakage rating as specified in Section 717.3.2.2.

717.3.3 Damper actuation.

717.3.3.5 Corridor damper actuation.
Corridor *damper* actuation shall be in accordance with Sections 717.3.3.1 and 717.3.3.2.

Q: *OK, I GET THAT BUT WHAT IS A FIRE-RESISTANT RATED ASSEMBLY?*

A: See **Sections 706 – 713** in the 2018 NCBC

THE FIVE WALLS

Sections 706 – 710 of the 2018 NCBC

FIVE DIFFERENT TYPES OF FIRE RATED/ SMOKE WALLS

Fire Walls	2018 NCBC Section **706**
Fire Barriers	2018 NCBC Section **707**
Fire Partitions	2018 NCBC Section **708**
Smoke Barriers	2018 NCBC Section **709**
Smoke Partitions	2018 NCBC Section **710**

FIRE WALL

(NCBC 706)

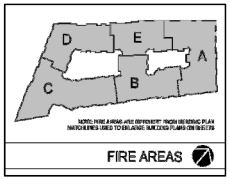
706.1 General. Each portion of a building separated by one or more *fire walls* that comply with the provisions of this section shall be considered a separate building. The extent and location of such *fire walls* shall provide a complete separation. Where a *fire wall* separates occupancies that are required to be separated by a *fire barrier* wall, the most restrictive requirements of each separation shall apply.

706.1.1 Party walls. Any wall located on a *lot line* between adjacent buildings, which is used or adapted for joint service between the two buildings, shall be constructed as a *fire wall* in accordance with Section 706. Party walls shall be constructed without openings and shall create separate buildings.

- Separates Buildings
- Continuous from foundation to roof
- Structurally independent
- Rated from 2 – 4 hours
- Openings – 156 sf max up to 25% of wall if non-sprinklered (no openings allowed in party walls)

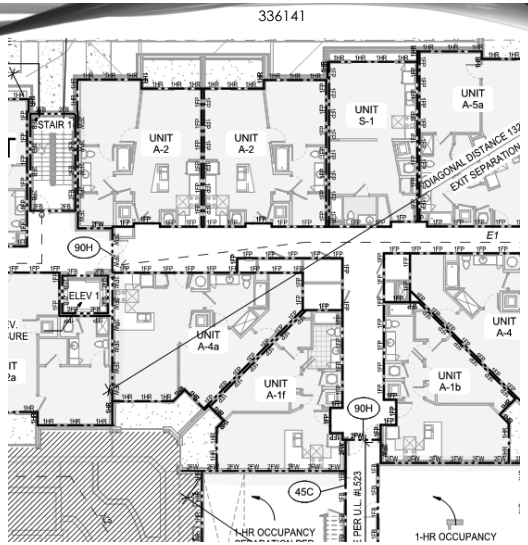
QUARTERS AT MOREHEAD

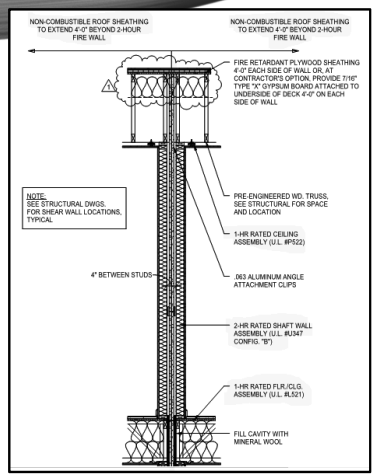
This project will serve as our example to illustrate the different types and applications of the five walls

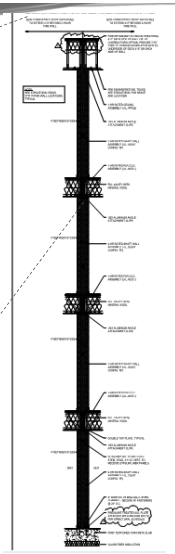


EXAMPLE OF 2 HOUR FIRE WALLS

Separates one building into two (or more) buildings which allows for larger structures as well as a change of construction type.







Continuous from foundation to roof deck

UL ASSEMBLY U347

Design No. U347

May 08, 2018

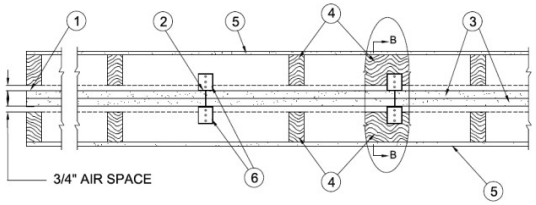
Nonbearing Wall Rating — 2 Hr (See Items 4, 4A and 4B) (Separation Wall, See Items 1,2 and 3)

Bearing Wall Rating 2 Hr. (Protected Wall, See Items 4 and 4A)

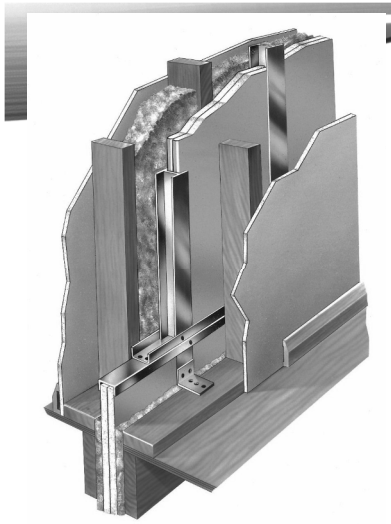
Nonbearing Wall Rating 2-Hr (Protected Wall, See Item 4, 4A and 4B)

Finish Rating — 120 Min (See Item 4)

STC Ratings — 61, 69, 70 (See Items 7 - 7B)



CONFIGURATION B
EXPOSED TO FIRE FROM EITHER SIDE



Artist's Rendering

Actual Installation

SHAFTLINER FIRE WALL SYSTEM

This is a different project and shows a different but similar UL design installation. Note the continuity of the shaftliner panels through the floor system, the platform framing of the walls and the bracing on the liner panels which is needed because the outermost wall has not been built yet.

TERMINATION OF FIRE WALLS

706.6 Vertical continuity. *Fire walls* shall extend from the foundation to a termination point not less than 30 inches (762 mm) above both adjacent roofs.

Exceptions:

1. Stepped buildings in accordance with Section 706.6.1.
2. Two-hour fire-resistance-rated walls shall be permitted to terminate at the underside of the roof sheathing, deck or slab, provided:
   - 2.1. The lower roof assembly within 4 feet (1220 mm) of the wall has not less than a 1-hour *fire-resistance rating* and the entire length and span of supporting elements for the rated roof assembly has a *fire-resistance rating* of not less than 1 hour.
   - 2.2. Openings in the roof shall not be located within 4 feet (1220 mm) of the *fire wall*.
   - 2.3. Each building shall be provided with not less than a Class B roof covering.

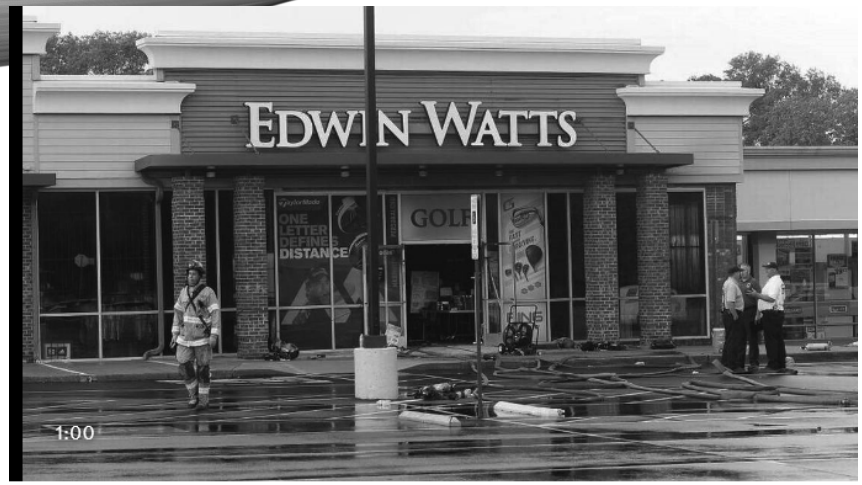
TERMINATION OF A FIRE WALL

Parapet Condition

WHY IT'S IMPORTANT TO GET CONTINUITY

CASE STUDY

Edwin Watts Golf Store



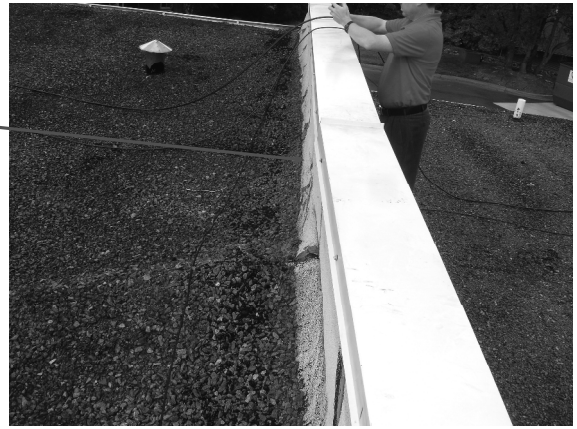
FIRE AT COUNTRYSIDE SHOPPING CENTER

Edwin Watts Golf Store struck by lightning which started a fire. 20-year-old firefighter was killed when he got disoriented inside the store during the blaze. He was pulled out of the store by fellow firefighters and immediately administered aid from an ambulance crew but died at the hospital later from the effects of smoke inhalation.

Fire wall terminated in a parapet since the roofs were stepped.

PARAPET BETWEEN GOLF STORE AND FAMILY DOLLAR

Obviously, the parapet is greater than 30" tall which is the minimum height required. However …



… it was not installed properly.

The fire revealed problems inside and out

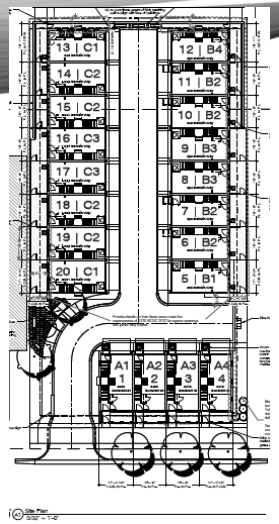
IMPACT OF THE FIRE ON THE BUILDINGS

- Because of the problems with continuity and structural integrity of the fire wall, the Dollar General Store next door was closed also and not allowed to re-open until the wall was made secure. The Edwin Watts Golf Store was a total loss from the fire but the neighboring store lost significant revenue because of the issues with the fire wall.

PARTY WALLS

706.1.1 Party walls. Any wall located on a *lot line* between adjacent buildings, which is used or adapted for joint service between the two buildings, shall be constructed as a *fire wall* in accordance with Section 706. Party walls shall be constructed without openings and shall create separate buildings.

Exception: Openings in a party wall separating an *anchor building* and a mall shall be in accordance with Section 402.4.2.2.1.



TOWNHOUSES

C1 Building B - Front Elevation
3/16" = 1'-0"

4. In buildings of Type III, IV and V construction, walls shall be permitted to terminate at the underside of combustible roof sheathing or decks, provided:
   - 4.1. There are no openings in the roof within 4 feet (1220 mm) of the *fire wall*,
   - 4.2. The roof is covered with a minimum Class B roof covering, and
   - 4.3. The roof sheathing or deck is constructed of *fire-retardant-treated wood* for a distance of 4 feet (1220 mm) on both sides of the wall or the roof is protected with $^{5}/_{8}$-inch (15.9 mm) Type X gypsum board directly beneath the underside of the roof sheathing or deck, supported by not less than 2-inch (51 mm) nominal ledgers attached to the sides of the roof framing members for a distance of not less than 4 feet (1220 mm) on both sides of the *fire wall*.
5. In buildings designed in accordance with Section 510.2, *fire walls* located above the 3-hour *horizontal assembly* required by Section 510.2, Item 1 shall be permitted to extend from the top of this *horizontal assembly*.
6. Buildings with sloped roofs in accordance with Section 706.6.2.

Fire Retardant Treated Wood (FRTW)

PYRO-GUARD ®
— HOOVER —
TREATED WOOD PRODUCTS INC.
(PLANT LOCATION)
PROCESS CONTROL STANDARD 2200P MONITORED BY TP
KDAT ICC-ESR-1791 MEA-359-88-M KDAT

TREATED LUMBER
15P9 R7002

SPECIES
SURFACE BURNING CHARACTERISTICS
FLAMESPREAD:
SMOKE DEVELOPED:
30 MINUTE TEST

Example of Stamp

2303.2 Fire-retardant-treated wood. *Fire-retardant-treated wood* is any wood product which, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E84 or UL 723, a *listed* flame spread index of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional 20-minute period. Additionally, the flame front shall not progress more than $10^{1}/_{2}$ feet (3200 mm) beyond the centerline of the burners at any time during the test.

FRTW – Completed Stamp

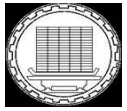
EXTERIOR FIRE-X ®
HOOVER
TREATED WOOD PRODUCTS INC.
PINE BLUFF, AR.
PROCESS CONTROL STANDARD 2200 E MONITORED BY TP
KDAT KDAT

UNDERWRITERS LABORATORIES INC. ®
CLASSIFIED
TREATED LUMBER
15P9 R7002
EXTERIOR FIRE-X, TYPE II
FLAME SPREAD 15
SMOKE DEVELOPED 50
SOUTHERN YELLOW PINE - 30 MIN. TEST
++ NO INCREASE IN THE LISTED CLASSIFICATION WHEN SUBJECTED TO THE STANDARD RAIN TEST

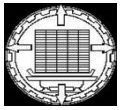
TREATING PROCESS

TREATMENT PROCESS

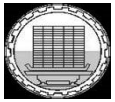
Dry wood is loaded into cylinder



Initial vacuum pulls out air



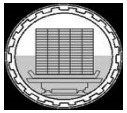
Liquid fire retardants fill cylinder



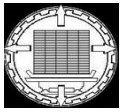
TREATMENT PROCESS

Pressure forces liquid into wood

Remaining liquid emptied for later use



Final vacuum removes excess liquid



Fire Retardant treated Wood (FRTW) is **not** fireproof or non-combustible. It is treated to slow down (retard) the rate of consumption of the material by the fire

Isokern Fireplace

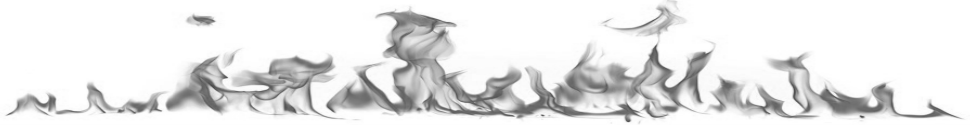
FlameBlock is a product name for FRT OSB that is coated on one or both sides with a cementitious coating which gives it a greater flame resistance

NO OPENINGS WITHIN 4' OF PARTY WALL

From Section 717

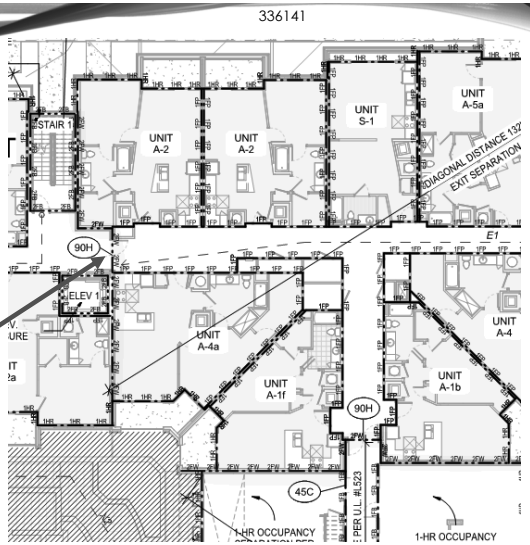
717.5.1 Fire walls. Ducts and air transfer openings permitted in *fire walls* in accordance with Section 706.11 shall be protected with *listed fire dampers* installed in accordance with their listing.

717.5.1.1 Horizontal exits. A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a *fire wall* that serves as a horizontal *exit*.



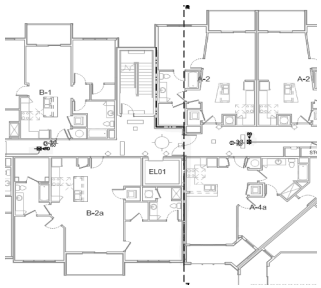
EXAMPLE OF 2 HOUR FIRE WALLS

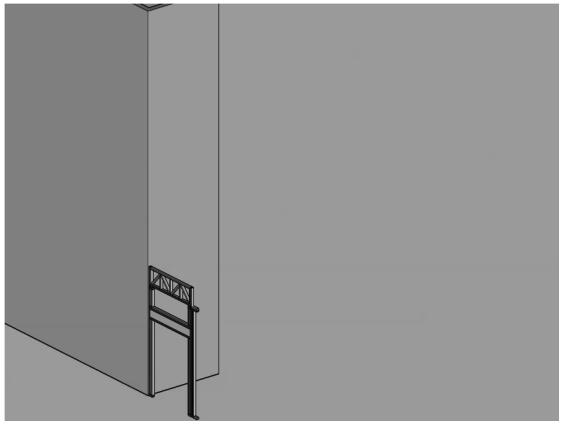
Note: These Fire Walls also serve as Horizontal Exits in this structure



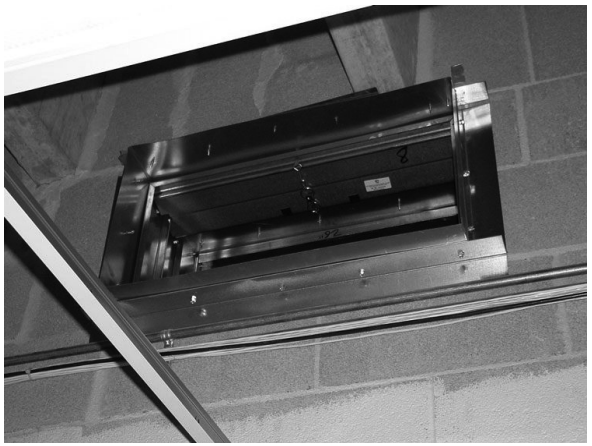
Wood Frame Fire Wall / Fire Barrier

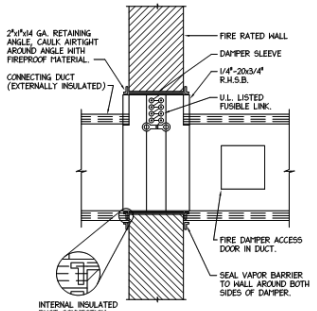
The wall must be continuous to the floor deck in order to be considered complete so any ductwork installed in the floor system should terminate before the wall or have a damper installed at the wall penetration.



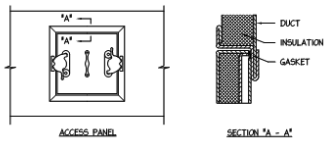


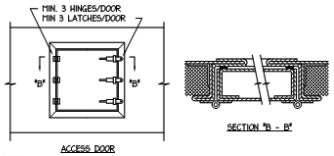
https://firedamper.com/wp-content/uploads/2017/08/Fire_Damper_Install_Instructions.pdf





9 DUCT FIRE DAMPER DETAIL
NO SCALE

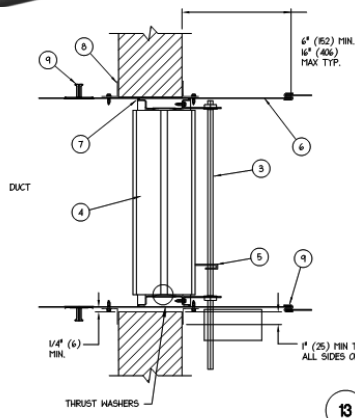




NOTES:

1. LATCHES SHALL BE OF THE WEDGE TYPE TO CLOSE DOORS TIGHTLY.
2. HINGES ON THE ACCESS DOORS SHALL HAVE NON-CORROSIVE PINS.
3. PROVIDE ACCESS DOORS ON DUCTWORK INSTALLED IN CHASE, ABOVE CEILING, INSTALLED IN EQUIPMENT ROOMS. PROVIDE ACCESS PANELS ON ALL EQUIPMENT AND DUCTWORK INSTALLED ABOVE FINISHED CEILINGS WHERE SPACE LIMITATIONS DO NOT ALLOW HINGED DOORS TO OPEN.
4. DOORS/PANELS TO HAVE UL LISTING WHERE LOCATED IN RATED CHASE ASS'Y.

10 ACCESS DOOR AND PANEL DETAILS
NO SCALE



NOTES

1. ACTUATOR (LOCATION MAY VARY). DAMPER MAY BE SUPPLIED WITHOUT ACTUATOR INSTALLED. RUSKIN'S UL LISTED FIRE DAMPER ACTUATORS MAY BE FIELD INSTALLED IF PROPERLY LABELED. SEE ACTUATOR INSTALLATION INSTRUCTIONS FOR FIELD MOUNTING OF DAMPER ACTUATORS.
2. OPTIONAL FIRESTAT OR SP100
3. AUXILLARY OPERATING JACK SHAFT
4. DAMPER
5. OVER CENTER LOCK
6. SLEEVE
7. CAULKING MATERIAL (MAY BE ON EITHER SIDE OF DAMPER FRAME
8. PFMA OR CONVENTIONAL MOUNTING ANGLES
9. S-JOINT/DUCT MATE, SLEEVE TO DUCT

SEQUENCE OF OPERATION

FIRE/SMOKE DAMPER SHALL BE INTERLOCKED TO AH. DAMPER SHALL CLOSE AND SHUT DOWN AH UPON DETECTION OF SMOKE. DAMPER SHALL CLOSE WHEN TEMPERATURE REACHES 170° F AND SHALL SHUT DOWN AH.

13 DUCT FIRE/SMOKE DETAIL
NO SCALE

FIRE BARRIERS
(NCBC 707)

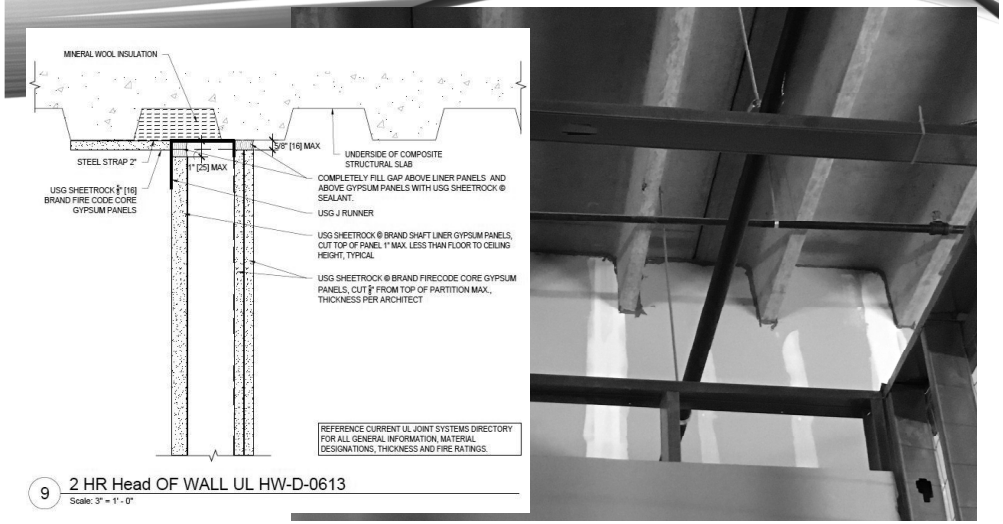
- Shaft Enclosures
- Exit Enclosures
- Exit Passageways
- Horizontal Exits
- Atria
- Control Areas
- Fire Areas
- Incidental Accessory Occupancies
- Separated Occupancies

- Separate Fire Areas / Occupancies
- Form Egress Components
- Continuous from foundation to roof
- Rated from 1 – 4 hours

707.5 Continuity. *Fire barriers* shall extend from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above and shall be securely attached thereto. Such *fire barriers* shall be continuous through concealed space, such as the space above a suspended ceiling. Joints and voids at intersections shall comply with Sections 707.8 and 707.9

Exceptions:

1. Shaft enclosures shall be permitted to terminate at a top enclosure complying with Section 713.12.
2. *Interior exit stairway* and *ramp* enclosures required by Section 1023 and *exit access stairway* and *ramp* enclosures required by Section 1019 shall be permitted to terminate at a top enclosure complying with Section 713.12.



Engineered Judgement

- Used to devise fire ratings for combinations of materials that have not been tested as an assembly
- Allowed by NCBC Section 703.3, #4 – Engineering Analysis
- Must be designed and sealed by an Engineer who must also inspect it for compliance with their design
- Based on known reactions of materials when exposed to fire

Labeling of rated walls is required by Code Section 703.6 however, this should say "*1 Hour Fire-**rated** Wall*" or "*1 Hour Fire Barrier*." There is no such thing as a 1 hour rated Fire Wall.

717.5.2 Fire barriers. Ducts and air transfer openings of *fire barriers* shall be protected with *approved fire dampers* installed in accordance with their listing. Ducts and air transfer openings shall not penetrate enclosures for *interior exit stairways* and *ramps* and *exit passageways*, except as permitted by Sections 1023.5 and 1024.6, respectively.

Exception: *Fire dampers* are not required at penetrations of *fire barriers* where any of the following apply:

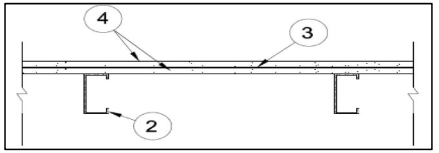
1. Penetrations are tested in accordance with ASTM E119 or UL 263 as part of the fire-resistance-rated assembly.
2. Ducts are used as part of an *approved* smoke control system in accordance with Section 909 and where the use of a *fire damper* would interfere with the operation of a smoke control system.
3. Such walls are penetrated by ducted HVAC systems, have a required *fire-resistance rating* of 1 hour or less, are in areas of other than Group H and are in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2. For the purposes of this exception, a ducted HVAC system shall be a duct system for conveying supply, return or exhaust air as part of the structure's HVAC system. Such a duct system shall be constructed of sheet steel not less than No. 26 gage thickness and shall be continuous from the air-handling appliance or equipment to the air outlet and inlet terminals.

BOXED DUCT OR PLUMBING LINE

Boxing-in this duct or plumbing line allows it to be included into the fire barrier and "separated" from the room

ONE-SIDED UL DESIGNS ARE RARE BUT DO EXIST

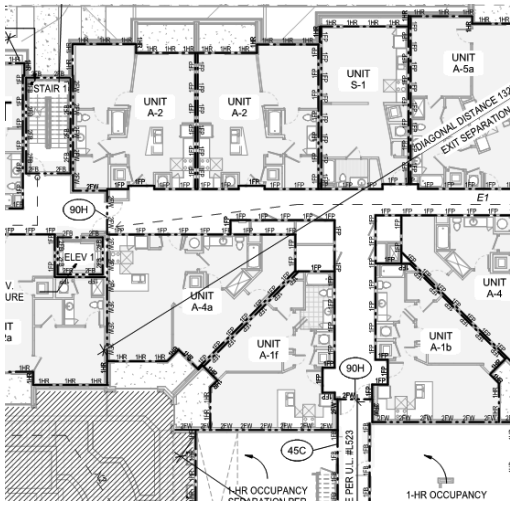
There is a corridor on the other side of this wall. The steel is protected based on the Type of Construction of the building, but the corridor is rated by a UL Assembly so the duct penetration either needs a damper or the ceiling of the corridor must be rated the same as the corridor walls. UL Assembly V497

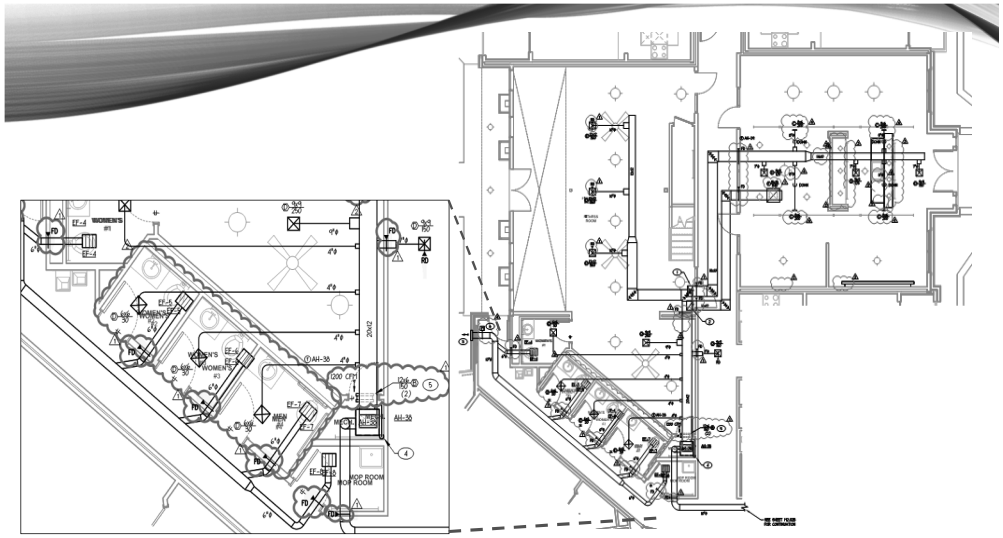


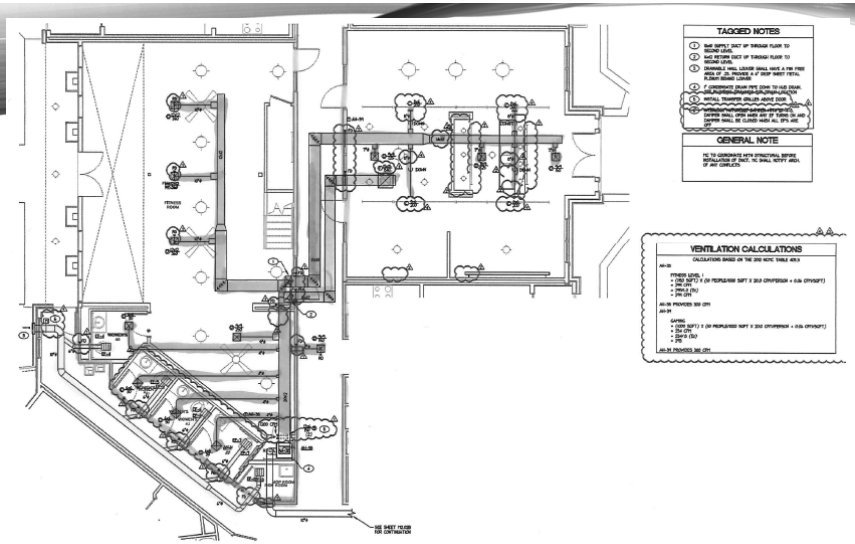
EXAMPLE OF 2 HOUR FIRE BARRIERS

Separates (compartmentalizes) the occupancies and isolates the shafts

Note: There should be a smoke curtain over the elevator shaft opening since it opens directly onto the corridor. Also, FW's act as separation walls in this case.

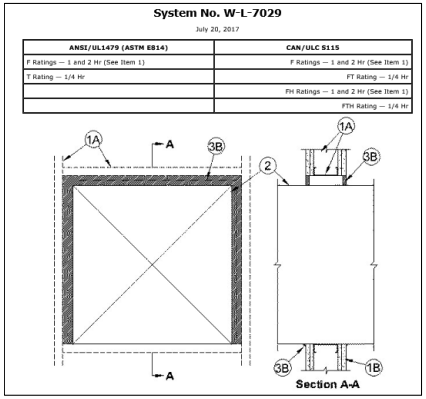




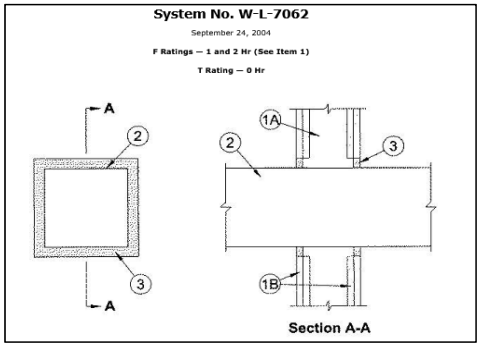


UL THROUGH PENETRATION DESIGNS

System No. W-L-7029



System No. W-L-7062



ONE HOUR GYP WALL TEST

With various penetrations having different firestopping methods

F RATING. The time period that the *through-penetration firestop system* limits the spread of fire through the penetration when tested in accordance with ASTM E814 or UL 1479.

T RATING. The time period that the *penetration firestop system*, including the penetrating item, limits the maximum temperature rise to 325°F (163°C) above its initial temperature through the penetration on the nonfire side when tested in accordance with ASTM E814 or UL 1479.

L RATING. The air leakage rating of a *through penetration firestop system* or a fire-resistant *joint* system when tested in accordance with UL 1479 or UL 2079, respectively.

FIRE PARTITIONS
(NCBC 709)

- Separate Dwelling Units
- Separate Sleeping Units
- Tenant Walls in Covered Malls
- Corridor Walls
- Elevator Lobby Walls

- Separate Sleeping Units / Dwelling Units / Tenants
- Form Corridors or Elevator Lobbies
- Continuous from fnd to roof
- Rated from 0.5 – 4 hours

Elevator Lobby

Framed from foundation to rated assembly (not continuous to floor or roof deck above)so this is a fire partition, not a fire barrier

Not continuous to roof deck. Assembly to assembly = fire partition

717.5.4 Fire partitions. Ducts and air transfer openings that penetrate *fire partitions* shall be protected with *listed fire dampers* installed in accordance with their listing.

Exceptions: In occupancies other than Group H, *fire dampers* are not required where any of the following apply:

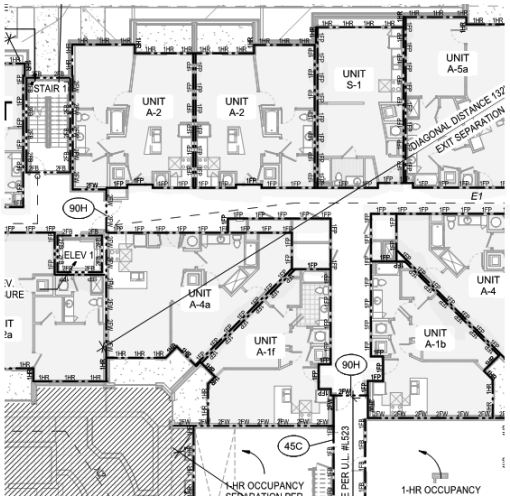
1. Corridor walls in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2 and the duct is protected as a *through penetration* in accordance with Section 714.
2. Tenant partitions in *covered and open mall buildings* where the walls are not required by provisions elsewhere in the code to extend to the underside of the floor or roof sheathing, slab or deck above.
3. The duct system is constructed of *approved* materials in accordance with the *International Mechanical Code* and the duct penetrating the wall complies with all of the following requirements:
   - 3.1. The duct shall not exceed 100 square inches (0.06 m^2).
   - 3.2. The duct shall be constructed of steel not less than 0.0217 inch (0.55 mm) in thickness.
   - 3.3. The duct shall not have openings that communicate the *corridor* with adjacent spaces or rooms.
   - 3.4. The duct shall be installed above a ceiling.
   - 3.5. The duct shall not terminate at a wall register in the fire-resistance-rated wall.
   - 3.6. A minimum 12-inch-long (305 mm) by 0.060-inch-thick (1.52 mm) steel sleeve shall be centered in each duct opening. The sleeve shall be secured to both sides of the wall and all four sides of the sleeve with minimum $1^1/_2$-inch by $1^1/_2$-inch by 0.060-inch (38 mm by 38 mm by 1.52 mm) steel retaining angles. The retaining angles shall be secured to the sleeve and the wall with No. 10 (M5) screws. The *annular space* between the steel sleeve and the wall opening shall be filled with *mineral wool* batting on all sides.

717.5.4 Fire partitions.
Exceptions: In occupancies other than Group H, *fire dampers* are **not** required where any of the following apply:

4. Such walls are penetrated by ducted HVAC systems, have a required *fire-resistance rating* of 1 hour or less, and are in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2. For the purposes of this exception, a ducted HVAC system shall be a duct system for conveying supply, return or exhaust air as part of the structure's HVAC system. Such a duct system shall be constructed of sheet steel not less than No. 26 gage thickness and shall be continuous from the air-handling appliance or equipment to the air outlet and inlet terminals.

EXAMPLE OF 1 HOUR FIRE PARTITIONS

- Corridor Walls
- Dwelling Unit Separation Walls



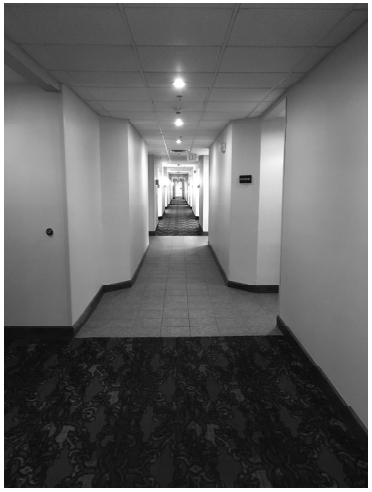
CORRIDOR WALLS

1018.6 Corridor continuity. Fire-resistance-rated corridors shall be continuous from the point of entry to an *exit*, and shall not be interrupted by intervening rooms.

Exception: Foyers, lobbies or reception rooms constructed as required for *corridors* shall not be construed as intervening rooms.

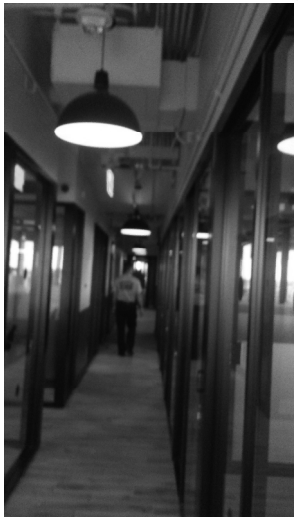
TABLE 1018.1
CORRIDOR FIRE-RESISTANCE RATING[a]

OCCUPANCY	OCCUPANT LOAD SERVED BY CORRIDOR	REQUIRED FIRE-RESISTANCE RATING (hours)	
		Without sprinkler system	With sprinkler system[c]
H-1, H-2, H-3	All	Not Permitted	1
H-4, H-5	Greater than 30	Not Permitted	1
A, B[d], E[d], F, M, S, U	Greater than 30	1	0
R	Greater than 10	Not Permitted	0.5
I-2[e], I-4	All	Not Permitted	0
I-1, I-3	All	Not Permitted	1[b]



Work without permits

Pulling air from the corridor and pushing it into the rooms.



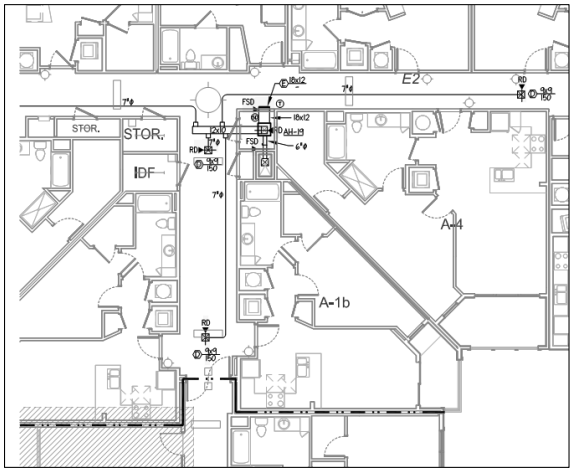
SECTION 717
DUCTS AND AIR TRANSFER OPENINGS

717.1 General. The provisions of this section shall govern the protection of duct penetrations and air transfer openings in assemblies required to be protected and duct penetrations in nonfire-resistance-rated floor assemblies.

717.1.1 Ducts and air transfer openings. Ducts transitioning horizontally between shafts shall not require a shaft enclosure provided that the duct penetration into each associated shaft is protected with *dampers* complying with this section.

717.1.2 Ducts that penetrate fire-resistance-rated assemblies without dampers. Ducts that penetrate fire-resistance-rated assemblies and are not required by this section to have *dampers* shall comply with the requirements of Sections 714.2 through 714.3.3. Ducts that penetrate *horizontal assemblies* not required to be contained within a shaft and not required by this section to have *dampers* shall comply with the requirements of Sections 714.4 through 714.5.2.

717.1.2.1 Ducts that penetrate nonfire-resistance-rated assemblies. The space around a duct penetrating a nonfire-resistance-rated floor assembly shall comply with Section 717.6.3.



717.5.4.1 Corridors. Duct and air transfer openings that penetrate *corridors* shall be protected with dampers as follows:

1. A *corridor damper* shall be provided where corridor ceilings, constructed as required for the corridor walls as permitted in Section 708.4, Exception 3, are penetrated.
2. A *ceiling radiation damper* shall be provided where the ceiling membrane of a *fire-resistance-rated* floor-ceiling or roof-ceiling assembly, constructed as permitted in Section 708.4, Exception 2, is penetrated.
3. A listed smoke damper designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a corridor enclosure required to have smoke and draft control doors in accordance with Section 716.5.3.

Exceptions:

1. *Smoke dampers* are not required where the building is equipped throughout with an *approved* smoke control system in accordance with Section 909, and *smoke dampers* are not necessary for the operation and control of the system.
2. *Smoke dampers* are not required in *corridor* penetrations where the duct is constructed of steel not less than 0.019 inch (0.48 mm) in thickness and there are no openings serving the *corridor*.

717 Duct and Air transfer Openings

717.3.1 Damper testing.
Dampers shall be listed and labeled in accordance with the standards in this section.

5. Corridor dampers shall comply with requirements of both UL 555 and UL 555S. Corridor dampers shall demonstrate acceptable closure performance when subjected to 150 feet per minute (0.76 mps) velocity across the face of the damper during the UL 555 fire exposure test.

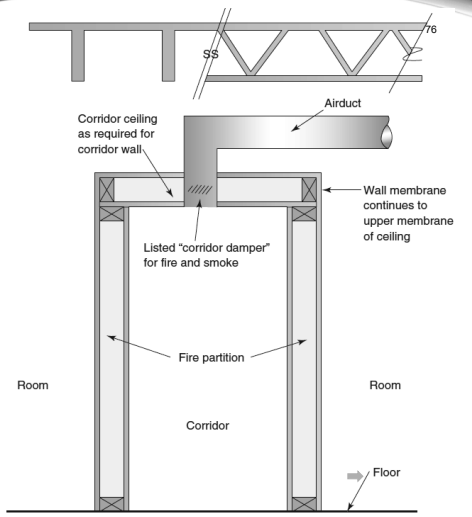
717.5 Where required.
Fire, dampers, smoke dampers, combination fire/smoke dampers, ceiling radiation dampers and *corridor dampers* shall be provided at the locations prescribed in Sections 717.5.1 through 717.5.7 and 717.6. Where an assembly is required to have both *fire dampers* and *smoke dampers*, *combination fire/smoke dampers* or a *fire damper* and a *smoke damper* shall be provided.

717.5.4.1 Corridors.
Duct and air transfer openings that penetrate corridors shall be protected with dampers as follows:

1. A corridor damper shall be provided where corridor ceilings, constructed as required for the corridor walls as permitted in Section 708.4, Exception 3, are penetrated.
2. A ceiling radiation damper shall be provided where the ceiling membrane of a fire-resistance-rated floor-ceiling or roof-ceiling assembly, constructed as permitted in Section 708.4, Exception 2, is penetrated.

717.3, 717.5
CORRIDOR DAMPERS

- Where a duct penetration occurs in the ceiling of a fire-resistance-rated corridor where the lid of the corridor is constructed using a corridor wall placed horizontally, a corridor damper is now specifically mandated.



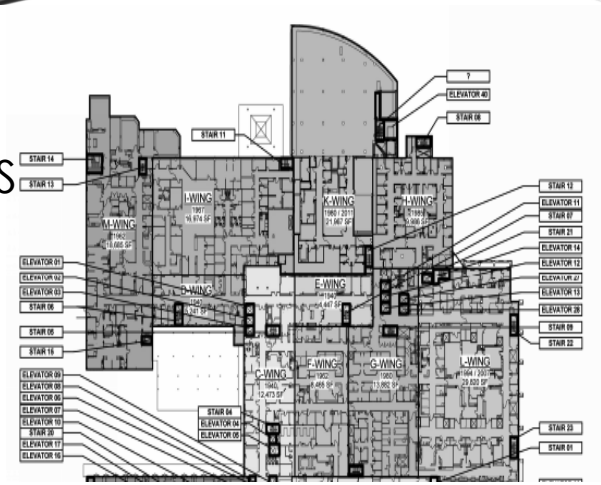
SMOKE BARRIERS
(NCBC 709)

709.4 Continuity. *Smoke barriers* shall form an effective membrane continuous from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, deck or slab above, including continuity through concealed spaces, such as those found above suspended ceilings, and interstitial structural and mechanical spaces. The supporting construction shall be protected to afford the required *fire-resistance rating* of the wall or floor supported in buildings of other than Type IIB, IIIB or VB construction. *Smoke barrier* walls used to separate smoke compartments shall comply with Section 709.4.1. *Smoke-barrier* walls used to enclose areas of refuge in accordance with Section 1009.6.4 or to enclose elevator lobbies in accordance with Section 405.4.3, 3007.6.2, or 3008.6.2 shall comply with Section 709.4.2.

- Separate Smoke Compartments
- Continuous from foundation to roof
- Rated from 1 – 2 hours
- Inherently a Fire Barrier
- Note: Areas of Refuge, or elevator lobbies for UG bldgs., FSAE's or for OEE's must comply with 709.4.2

SMOKE COMPARTMENTS

Formed by Smoke Barriers. Primarily in Institutional Occupancies



717.5.5 Smoke barriers. A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a *smoke barrier*. *Smoke dampers* and *smoke damper* actuation methods shall comply with Section 717.3.3.2.

Exceptions:

1. *Smoke dampers* are not required where the openings in ducts are limited to a single *smoke compartment* and the ducts are constructed of steel.
2. *Smoke dampers* are not required in *smoke barriers* required by Section 407.5 for Group I-2, Condition 2—where the HVAC system is fully ducted in accordance with Section 603 of the *International Mechanical Code* and where buildings are equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 and equipped with quick-response sprinklers in accordance with Section 903.3.2.

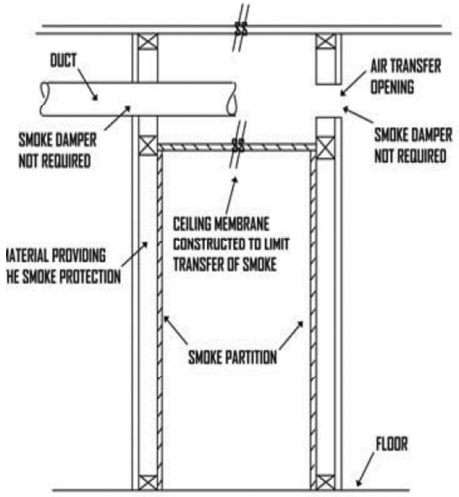
SMOKE PARTITIONS
(NCBC 710)

710.1 General. Smoke partitions installed as required elsewhere in the code shall comply with this section.

710.2 Materials. The walls shall be of materials permitted by the building type of construction.

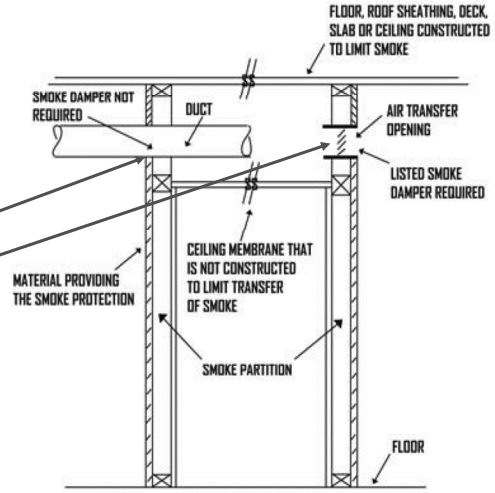
710.3 Fire-resistance rating. Unless required elsewhere in the code, smoke partitions are not required to have a *fire-resistance rating*.

710.4 Continuity. Smoke partitions shall extend from the top of the foundation or floor below to the underside of the floor or roof sheathing, deck or slab above or to the underside of the ceiling above where the ceiling membrane is constructed to limit the transfer of smoke.



710.8 Ducts and air transfer openings. The space around a duct penetrating a smoke partition shall be filled with an *approved* material to limit the free passage of smoke. Air transfer openings in smoke partitions shall be provided with a *smoke damper* complying with Section 717.3.2.2.

Exception: Where the installation of a *smoke damper* will interfere with the operation of a required smoke control system in accordance with Section 909, *approved* alternative protection shall be utilized.



717.5.7 Smoke partitions. A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point that an air transfer opening penetrates a smoke partition. *Smoke dampers* and *smoke damper* actuation methods shall comply with Section 717.3.3.2.

Exception: Where the installation of a *smoke damper* will interfere with the operation of a required smoke control system in accordance with Section 909, *approved* alternative protection shall be utilized.

FLOOR & ROOF ASSEMBLIES

Section 2

HORIZONTAL ASSEMBLIES
(NCBC 712)

711.2 Horizontal assemblies. *Horizontal assemblies* shall comply with Sections 711.2.1 through 711.2.6.

711.2.1 Materials. Assemblies shall be of materials permitted by the building type of construction.

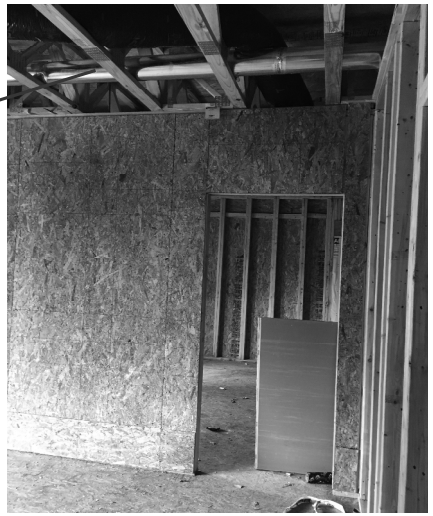
711.2.2 Continuity. Assemblies shall be continuous without vertical openings, except as permitted by this section and Section 712.

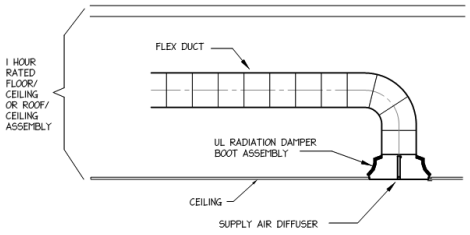
711.2.3 Supporting construction. The supporting construction shall be protected to afford the required *fire-resistance rating* of the *horizontal assembly* supported.

- Separate Fire Areas / Occupancies
- Form Egress Components
- Must be supported by construction of same rating
- Rated from 0.5 – 4 hours

Solid Duct run through horizontal assembly (floor-ceiling)

This picture is from the first level of a set of two- story apartments. The OSB wall is inside the unit but serves as a shear wall for the building. Because there is an apt unit over top of this one, the F/C assembly must be rated for dwelling unit separation.





NOTE:

1. SEE FLOOR PLANS AND SPECIFICATIONS FOR DUCT INSULATION REQUIREMENTS.
2. PROVIDE UL RADIATION DAMPER/BLANKET ASS'Y.

2 SUPPLY AIR DIFFUSER DETAIL
NO SCALE

From UL L550 Cutsheet

4. **Damper*** — For use with min 18 in. deep trusses. Max nom 20 in. long by 18 in. wide by 2-1/8 in. high, fabricated from galvanized steel. Plenum box max size nom 21 in. long by 18 in. wide by 16 in. high fabricated from either galvanized steel or Classified Air Duct Materials bearing the UL Classification Marking for Class 0 or Class 1 rigid air duct material. Installed in accordance with the instructions provided by the manufacturer. Max damper openings not to exceed 180 sq in. per 100 sq ft of ceiling area.

NAILOR INDUSTRIES INC — Types 0755, 0755A, 0756, 0756D , 0757, 0757D, 0757FP, 0757DFP, 0758, 0759, 0760, 0761, 0762, CRD5, CRD5D, CRD6, CRD6D, CRD6FP, CRD6DFP

UL DESIGN CUTSHEET

Assembly must be put in **exactly** as tested and as outlined in the cutsheet. Penetration details must match, also.

Design No. L550

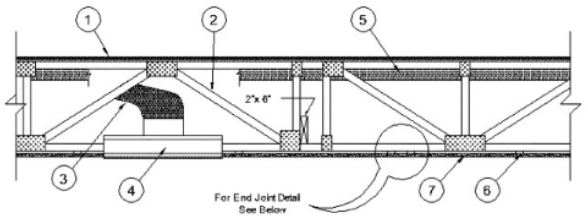
October 08, 2018

Unrestrained Assembly Rating — 1 Hr.

Finish Rating — 23 Min (See Items 5 or 5A and 7), 20 Min. (See Items 6E and 7A)

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



From the front of the UL Directory

12. Dampers

Building codes include requirements for four types of dampers: fire dampers, smoke (leakage-rated) dampers, ceiling dampers, and corridor dampers. Dampers have been investigated for installation in wall or ceiling constructions in the maximum sizes and orientations (vertical or horizontal) indicated in their certification. Dampers have been investigated for the following applications:

Fire Dampers (EMME) are intended for use where air ducts and air-transfer openings traverse fire-resistance-rated walls and floors.

Leakage-rated (Smoke) Dampers (EMME) are intended for use where air ducts and air-transfer openings traverse smoke barriers.

Corridor Dampers (EMME) are intended for use where air ducts penetrate or terminate at horizontal openings in the ceilings of certain corridors, as required by the building code.

Air Terminal Units (BZGU), **Ceiling Air Diffusers** (BZZU) and **Ceiling Dampers** (CABS) are intended to function as a heat barrier in air-handling openings penetrating fire-resistive membrane ceilings. Additional details on duct outlet protection methods for membrane ceiling constructions, designated Systems A and B, is included under **Section III. FLOOR-CEILINGS AND ROOF-CEILINGS, Item 16, Air Ducts and Protection Systems**.

From the front of the UL Directory

16. Air Ducts and Protection Systems

Unless otherwise specified by the design, the ratings were developed based on fire tests employing no air movement. The ratings, therefore, require that air movement be effectively stopped at the start of a fire.

Unless specified otherwise, the minimum distance between the bottom of the duct and the top of ceiling membrane should not be less than 4 in.; where a greater minimum distance is specified, it may be reduced to 4 in. minimum. For ducts equipped with hinged sheet-steel dampers over duct outlets, unless specified otherwise, the maximum distance between the bottom of the duct and the top of the ceiling should not exceed 8 in. When certified ceiling dampers are used, no limit is required for the maximum distance between the bottom of the duct and the top of the ceiling since fire dampers are installed close to the top of ceiling membrane per installation instructions. Where hinged sheet-steel dampers are specified, they should be equipped with spring catches and corrosion-resistant hinges. Dampers designed to close by gravity should be installed to close in the direction of the air flow. Air diffusers should be of steel and attached to the duct outlet with steel sheet-metal screws. Spacing of screws should be at least three equally spaced for round diffusers and 8 in. OC max per side for square diffusers, with no less than one on each side.

717.6 Horizontal assemblies. Penetrations by ducts and air transfer openings of a floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly shall be protected by a shaft enclosure that complies with Section 713 or shall comply with Sections 717.6.1 through 717.6.3.

717.6.1 Through penetrations. In occupancies other than Groups I-2 and I-3, a duct constructed of *approved* materials in accordance with the *International Mechanical Code* that penetrates a fire-resistance-rated floor/ceiling assembly that connects not more than two *stories* is permitted without shaft enclosure protection, provided a *listed fire damper* is installed at the floor line or the duct is protected in accordance with Section 714.4. For air transfer openings, see Section 712.1.9.

Exception: A duct is permitted to penetrate three floors or less without a *fire damper* at each floor, provided such duct meets all of the following requirements:

1. The duct shall be contained and located within the cavity of a wall and shall be constructed of steel having a minimum wall thickness of 0.0187 inches (0.4712 mm) (No. 26 gage).
2. The duct shall open into only one *dwelling or sleeping unit* and the duct system shall be continuous from the unit to the exterior of the building.
3. The duct shall not exceed 4-inch (102 mm) nominal diameter and the total area of such ducts shall not exceed 100 square inches (0.065 m^2) in any 100 square feet (9.3 m^2) of floor area.
4. The *annular space* around the duct is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 or UL 263 time-temperature conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the *fire-resistance rating* of the construction penetrated.
5. Grille openings located in a ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly shall be protected with a *listed ceiling radiation damper* installed in accordance with Section 717.6.2.1.

PENETRATIONS

Through Penetration

Membrane Penetration

717.6.2 Membrane penetrations. Ducts and air transfer openings constructed of *approved* materials in accordance with the *International Mechanical Code* that penetrate the ceiling membrane of a fire-resistance-rated floor/ceiling or roof/ceiling assembly shall be protected with one of the following:

1. A shaft enclosure in accordance with Section 713.
2. A *listed ceiling radiation damper* installed at the ceiling line where a duct penetrates the ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly.
3. A *listed ceiling radiation damper* installed at the ceiling line where a diffuser with no duct attached penetrates the ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly.

717.6.2.1 Ceiling radiation dampers. *Ceiling radiation dampers* shall be tested in accordance with Section 717.3.1. *Ceiling radiation dampers* shall be installed in accordance with the details *listed* in the fire-resistance-rated assembly and the manufacturer's instructions and the listing. *Ceiling radiation dampers* are not required where one of the following applies:

1. Tests in accordance with ASTM E119 or UL 263 have shown that *ceiling radiation dampers* are not necessary in order to maintain the *fire-resistance rating* of the assembly.
2. Where exhaust duct penetrations are protected in accordance with Section 714.4.2, are located within the cavity of a wall and do not pass through another *dwelling unit* or tenant space.
3. Where duct and air transfer openings are protected with a duct outlet protection system tested as part of a *fire-resistance-rated* assembly in accordance with ASTM E119 or UL 263.

717.6.3 Nonfire-resistance-rated floor assemblies. Duct systems constructed of *approved* materials in accordance with the *International Mechanical Code* that penetrate nonfire-resistance-rated floor assemblies shall be protected by any of the following methods:

1. A shaft enclosure in accordance with Section 713.
2. The duct connects not more than two *stories*, and the *annular space* around the penetrating duct is protected with an *approved* noncombustible material that resists the free passage of flame and the products of combustion.
3. In floor assemblies composed of noncombustible materials, a shaft shall not be required where the duct connects not more than three stories, the annular space around the penetrating duct is protected with an approved noncombustible material that resists the free passage of flame and the products of combustion and a *fire damper* is installed at each floor line.

   Exception: *Fire dampers* are not required in ducts within individual residential *dwelling units*.

717.6 Horizontal assemblies.

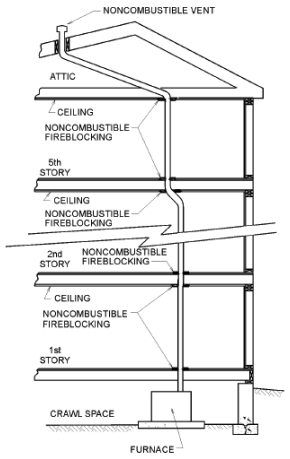
717.6.3 Nonfire-resistance-rated floor assemblies.

Duct systems constructed of *approved* materials in accordance with the *International Mechanical Code* that penetrate nonfire-resistance-rated floor assemblies shall be protected by any of the following methods:

3. In floor assemblies composed of noncombustible materials, a shaft shall not be required where the duct connects not more than three stories, the annular space around the penetrating duct is protected with an approved noncombustible material that resists the free passage of flame and the products of combustion and a fire damper is installed at each floor line.

714.5 Nonfire-resistance-rated assemblies. Penetrations of nonfire-resistance-rated floor or floor/ceiling assemblies or the ceiling membrane of a nonfire-resistance-rated roof/ceiling assembly shall meet the requirements of Section 713 or shall comply with Section 714.5.1 or 714.5.2.

714.5.1 Noncombustible penetrating items. Noncombustible penetrating items that connect not more than five *stories* are permitted, provided that the *annular space* is filled to resist the free passage of flame and the products of combustion with an *approved* noncombustible material or with a fill, void or cavity material that is tested and classified for use in *through-penetration firestop systems*.



NOTE: NONCOMBUSTIBLE VENTS, CHIMNEYS, CONDUITS, PIPES AND TUBES CAN CONNECT UP TO FIVE STORIES WHEN ANNULAR SPACE IS FILLED WITH AN APPROVED NONCOMBUSTIBLE MATERIAL

VERTICAL OPENINGS & SHAFT ENCLOSURES

Section 3

Vertical Openings without Enclosure

[redacted]

[BF] SHAFT. An enclosed space extending through one or more stories of a building, connecting vertical openings in successive floors, or floors and the roof.

[BF] SHAFT ENCLOSURE. The walls or construction forming the boundaries of a shaft.

717.5.3 Shaft enclosures. Shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with *approved* fire and smoke *dampers* installed in accordance with their listing.

Exceptions:

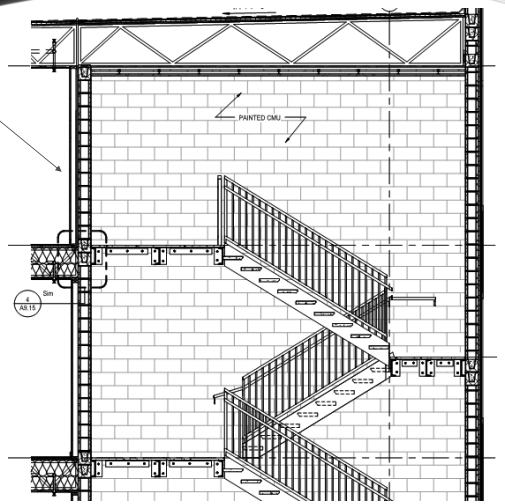
1. *Fire dampers* are not required at penetrations of shafts where any of the following criteria are met:
   1.1. Steel exhaust subducts are extended not less than 22 inches (559 mm) vertically in exhaust shafts, provided there is a continuous airflow upward to the outside.
   1.2. Penetrations are tested in accordance with ASTM E119 or UL 263 as part of the fire-resistance-rated assembly.
   1.3. Ducts are used as part of an *approved* smoke control system designed and installed in accordance with Section 909 and where the *fire damper* will interfere with the operation of the smoke control system.
   1.4. The penetrations are in parking garage exhaust or supply shafts that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.

2. In Group B and R occupancies equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, *smoke dampers* are not required at penetrations of shafts where all of the following criteria are met:
   2.1. Kitchen, clothes dryer, bathroom and toilet room exhaust openings are installed with steel exhaust subducts, having a minimum wall thickness of 0.0187-inch (0.4712 mm) (No. 26 gage).
   2.2. The subducts extend not less than 22 inches (559 mm) vertically.
   2.3. An exhaust fan is installed at the upper terminus of the shaft that is powered continuously in accordance with the provisions of Section 909.11, so as to maintain a continuous upward airflow to the outside.
3. *Smoke dampers* are not required at penetration of exhaust or supply shafts in parking garages that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.
4. *Smoke dampers* are not required at penetrations of shafts where ducts are used as part of an *approved* mechanical smoke control system designed in accordance with Section 909 and where the *smoke damper* will interfere with the operation of the smoke control system.
5. *Fire dampers* and *combination fire/smoke dampers* are not required in kitchen and clothes dryer exhaust systems where installed in accordance with the *International Mechanical Code*.

Shaft Enclosure

1023.5 Penetrations. Penetrations into or through *interior exit stairways* and *ramps* are prohibited except for equipment and ductwork necessary for independent ventilation or pressurization, sprinkler piping, standpipes, electrical raceway for fire department communication systems and electrical raceway serving the *interior exit stairway* and *ramp* and terminating at a steel box not exceeding 16 square inches (0.010 m^2). Such penetrations shall be protected in accordance with Section 714. There shall not be penetrations or communication openings, whether protected or not, between adjacent *interior exit stairways* and *ramps*.

Exception: Membrane penetrations shall be permitted on the outside of the *interior exit stairway* and *ramp*. Such penetrations shall be protected in accordance with Section 714.3.2.



1023.6 Ventilation. Equipment and ductwork for *interior exit stairway* and *ramp* ventilation as permitted by Section 1023.5 shall comply with one of the following items:

1. Such equipment and ductwork shall be located exterior to the building and shall be directly connected to the *interior exit stairway* and *ramp* by ductwork enclosed in construction as required for shafts.
2. Where such equipment and ductwork is located within the *interior exit stairway* and *ramp*, the intake air shall be taken directly from the outdoors and the exhaust air shall be discharged directly to the outdoors, or such air shall be conveyed through ducts enclosed in construction as required for shafts.
3. Where located within the building, such equipment and ductwork shall be separated from the remainder of the building, including other mechanical equipment, with construction as required for shafts.

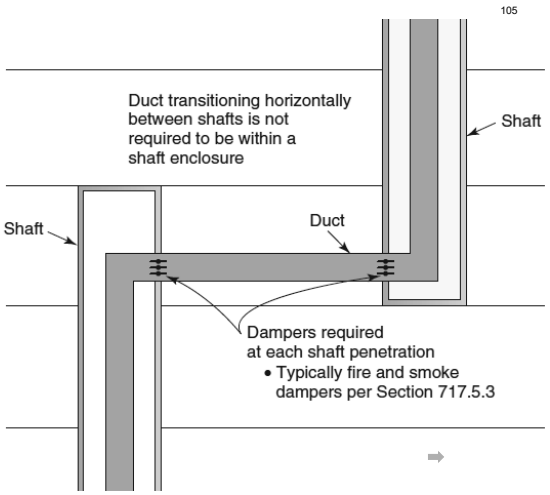
In each case, openings into the *fire-resistance-rated* construction shall be limited to those needed for maintenance and operation and shall be protected by opening protectives in accordance with Section 716 for shaft enclosures.

The *interior exit stairway* and *ramp* ventilation systems shall be independent of other building ventilation systems.

717.1.1 Ducts Transitioning Between Shafts

- Transitions permitted where exit and entry into shaft construction protected by appropriated dampers.
- Not applicable where:
  - Dampers are prohibited in duct system, such as where hazardous exhausts are present, and
  - Where “continuous” duct is required, such as grease duct enclosures serving a Type I hood.

Ducts are now allowed to exit a shaft, transition horizontally, and then enter another shaft without continuous shaft construction.



ENGINEERING JUDGEMENT FOR HVAC SHAFT

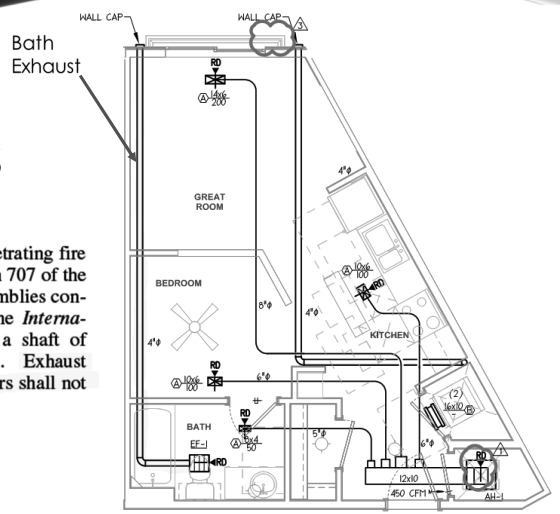
Shaft liner panels for 2 hour rated shaft sitting on hollow core concrete floor planks that are not 2 hour rated. Resulted in an EJ with filled planks

HOODS, DRYERS & EXHAUST FANS

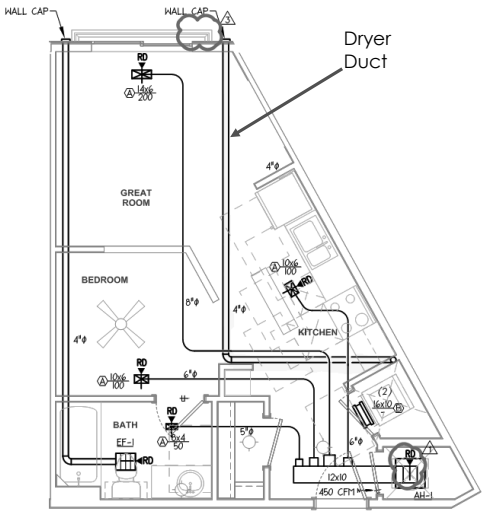
Section 4

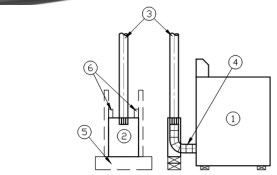
EXHAUST DUCTS

[F] 502.10.2 Penetrations. Exhaust ducts penetrating fire barriers constructed in accordance with Section 707 of the *International Building Code* or horizontal assemblies constructed in accordance with Section 711 of the *International Building Code* shall be contained in a shaft of equivalent fire-resistance-rated construction. Exhaust ducts shall not penetrate fire walls. Fire dampers shall not be installed in exhaust ducts.

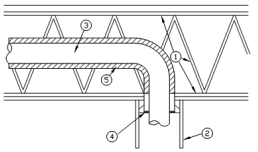


504.2 Exhaust penetrations. Where a clothes dryer exhaust duct penetrates a wall or ceiling membrane, the annular space shall be sealed with noncombustible material, ***approved*** fire caulking or a noncombustible dryer exhaust duct wall receptacle. Ducts that exhaust clothes dryers shall not penetrate or be located within any fireblocking, draftstopping or any wall, floor/ceiling or other assembly required by the ***International Building Code*** to be fire-resistance rated, unless such duct is constructed of galvanized steel or aluminum of the thickness specified in Section 603.4 and the fire-resistance rating is maintained in accordance with the ***International Building Code***. Fire dampers, combination fire/smoke dampers and any similar devices that will obstruct the exhaust flow shall be prohibited in clothes dryer exhaust ducts.





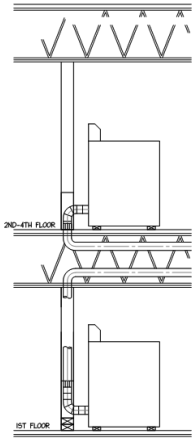
4 RECESSED METAL BOX FOR DRYER EXHAUST
NO SCALE



8 FIRESTOP-DRYER VENT IN WOOD FLOOR
NO SCALE

TABLE 603.4
DUCT CONSTRUCTION MINIMUM SHEET METAL THICKNESS FOR SINGLE DWELLING UNITS

DUCT SIZE	MINIMUM THICKNESS (inches)	EQUIVALENT GAGE (GALVANIZED)	ALUMINUM MINIMUM THICKNESS (inches) [gage]
Round ducts and enclosed rectangular ducts			
14 inches or less	0.013	30	0.0159 [26 ga]
Over 14 inches	0.016	28	0.0201 [24 ga]
Exposed rectangular ducts			
14 inches or less	0.016	28	0.0201 [24 ga]
Over 14 inches	0.019	26	0.0253 [22 ga]



3 DRYER VENT DETAIL
NO SCALE

PRE-ROCK IN BULKHEAD

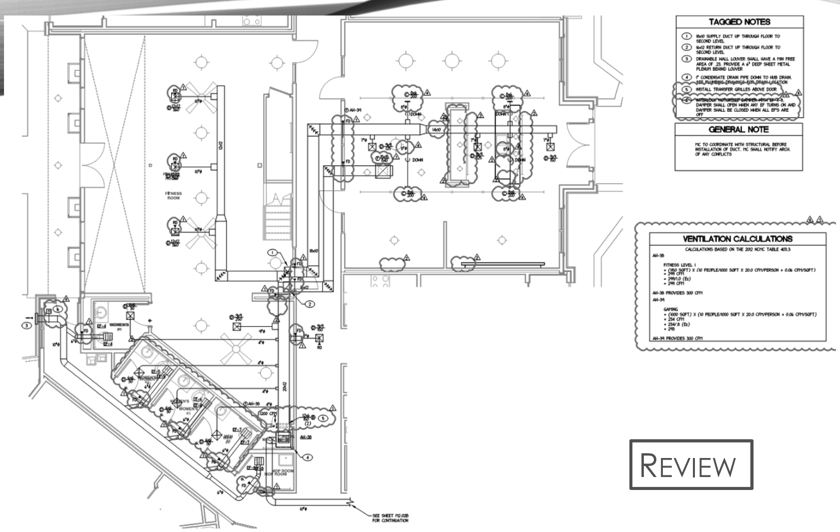
Putting sheetrock around the soffit encapsulates the duct and treats it as if it is in a shaft. This appears to be at the roof line, but if it is a floor / ceiling assembly, that assembly must be complete before the soffit is framed or the condition will require an engineering judgement.

PRE-ROCK IN BULKHEAD

All penetrations need to be sealed.

506.3.11 Grease duct enclosures. A commercial kitchen grease duct serving a Type I hood that penetrates a ceiling, wall, floor or any concealed space shall be enclosed from the point of penetration to the outlet terminal. In-line exhaust fans not located outdoors shall be enclosed as required for grease ducts. A duct shall penetrate exterior walls only at locations where unprotected openings are permitted by the *International Building Code*. The duct enclosure shall serve a single grease duct and shall not contain other ducts, piping or wiring systems. Duct enclosures shall be a shaft enclosure in accordance with Section 506.3.11.1, a field-applied enclosure assembly in accordance with Section 506.3.11.2 or a factory-built enclosure assembly in accordance with Section 506.3.11.3. Duct enclosures shall have a fire-resistance rating of not less than that of the assembly penetrated and not less than 1 hour. Fire dampers and smoke dampers shall not be installed in grease ducts.

Exception: A duct enclosure shall not be required for a grease duct or hood that penetrates only a nonfire-resistance-rated roof/ceiling assembly.



REVIEW

Questions?

March 7, 2019

Commercial Building Code Academy

This meeting was a 2-hr. review of Chapter 7 of the 2018 NCBC, directly from the book so there is no ppt.

Inspections

Code Academy

May 7, 2019

Pending Legislation from Current Session

- **HB 162** (2/25/19) – Requires 8 hrs of annual CE for GC's starting Jan 1, 2020. 2 hrs mandated by the board, 6 hrs elective
- **HB 448** (3/25/19) – City (160A) & County (153A) combined into GS 160D. Includes 160D-9-11 outdoor advertising (billboards) & Article 11 *Building Code Enforcement* 160D-11-1 – 160D-11-29 (pgs 71-85)
- **SB 355** (3/26/19) – Vested rights. Any issued development permit gives permit applicant the right to use the code / ordinances in effect at the time of the initial permit.
- **SB 566** (4/2/19) – Definition and regulations for Consumer Fireworks. Age for purchase increased to 18 from 16
- **SB 638** (4/3/19) - Gives DOI responsibility for fire protection inspections of State-owned buildings.
- **HB 675** (4/9/2019) – Mandates form info for element / component inspections and does not include the sentence, "*The term does not include a system.*"; TV & Film sets; Cost analysis for changes to NCECC; Nothing but Building Code holds up a CC; time limits on residential reviews (2 days for sealed, 5 days for non-sealed); changes to $ amount ($200,000) & floor area (5,000) for seal exemption
- **HB 730** (4/11/19) – Valet trash Service in apts. 13 gal can for enclosed corridors, 27 gal for open

Inspections Mandated by Statutes

SECTION 107
INSPECTIONS

107.1 General. The inspection department shall perform the following inspections:

1. Footing inspection;
2. Under slab inspection, as appropriate;
3. Foundation inspection, wood-frame construction;
4. Rough-in inspection;
5. Building framing;
6. Insulation inspection;
7. Fire protection inspection; and
8. Final inspection.

House Bills Regarding RDP Inspections

HB 255 (2015)

PART IX INSPECTIONS OF COMPONENTS OR ELEMENTS OF BUILDINGS CERTIFIED BY LICENSED ARCHITECTS OR LICENSED ENGINEERS

Section 9.(a) G.S. 153A-352(c) (2 *Field inspection of the … component or element of the building is performed by* ***that*** *licensed architect or licensed engineer*

HB 252 (2017)

AN ACT TO MAKE VARIOUS CHANGES AND CLARIFICATIONS TO THE STATUTES GOVERNING THE CREATION AND ENFORCEMENT OF BUILDING CODES

Section 2.(a) G.S. 153A-352(c) (2) *Field inspection of the … component or element of the building is performed by* ~~**that**~~ **a** *licensed architect or licensed engineer* ***or a person under*** [their] ***direct supervisory control.***

HB 948 (2018)

AN ACT TO MAKE VARIOUS CHANGES TO THE STATUTES GOVERNING BUILDING CODES, AS RECOMMENDED BY THE HOUSE SELECT COMMITTEE ON IMPLEMENTATION OF BUILDING CODE REGULATORY REFORM LEGISLATION

Section 1(e) G.S. 160A-413.5(a) … *a city* ***shall accept****, without further responsibility to inspect, a design or other proposal for a component or element … from a licensed …*

Process for acceptance of element / component inspection by licensed Architect or Engineer per **HB252**

http://www.ncdoi.com/OSFM/Engineering_and_Codes/Documents/Interpretations4/Guidance%20Papers/GS%20153A-352%20GS%20160A-412%20-%20Acceptance%20of%20Licensed%20Architect%20or%20Engineer%20Inspections.pdf

A/E

- Completes form to request to inspect element in lieu of inspector
- Submits form to Code Administrator

CA

- Reviews form and approves or disapproves
- Responds to requestor & files with permit

A/E

- Performs inspection of specified element / component
- Documents inspection and uploads copy to permit

Inspector

- Makes note of which element / component was inspected by A/E
- Performs rest of inspection and results with notes

107.4 Independent inspections authorized by the code enforcement official.

The code enforcement official may authorize a North Carolina registered design professional to inspect the following structural elements, components and systems:

1. The excavation of soil and/or forming of footings with the associated placement of reinforcing steel prior to pouring concrete; and
2. The forming of floors, columns, beams and other structural members, including the placement of reinforcing steel prior to pouring concrete.

To utilize this procedure, the permit holder must continue to schedule all inspections normally required for this work by the inspection department. The registered design professional shall provide weekly reports bearing his seal to the inspection department indicating that the placement of the related construction elements, components and systems either complies or does not comply with the approved permit documents. Any change from the permit documents shall be approved by the code enforcement official prior to its implementation. The permit holder shall immediately inform the code enforcement official if he or she terminates his or her relationship with the registered design professional.

Seems to describe inspections under HB 252

Process for acceptance of element / component inspection by licensed Architect or Engineer per **HB948**

MCCE staff met with Representative Brody, the initiator of the House Bill, on Sep 28, 2018 and verified with him that this bill was **only meant to cover footing inspections** primarily on Residential structures.

GC

- Requests RDP inspection under the Alternate Inspection Methods (AIM) listed on his / her dashboard.
- This will schedule an inspection for the GC (not the inspector) and the GC will get a confirmation email that it has been scheduled

A/E

- Once the Architect or Engineer has done the footing inspection, he / she will upload to the permit the completed RDP Inspection Form along with a signed, sealed letter attesting that the footing inspection complies with the applicable NC Code.

GC

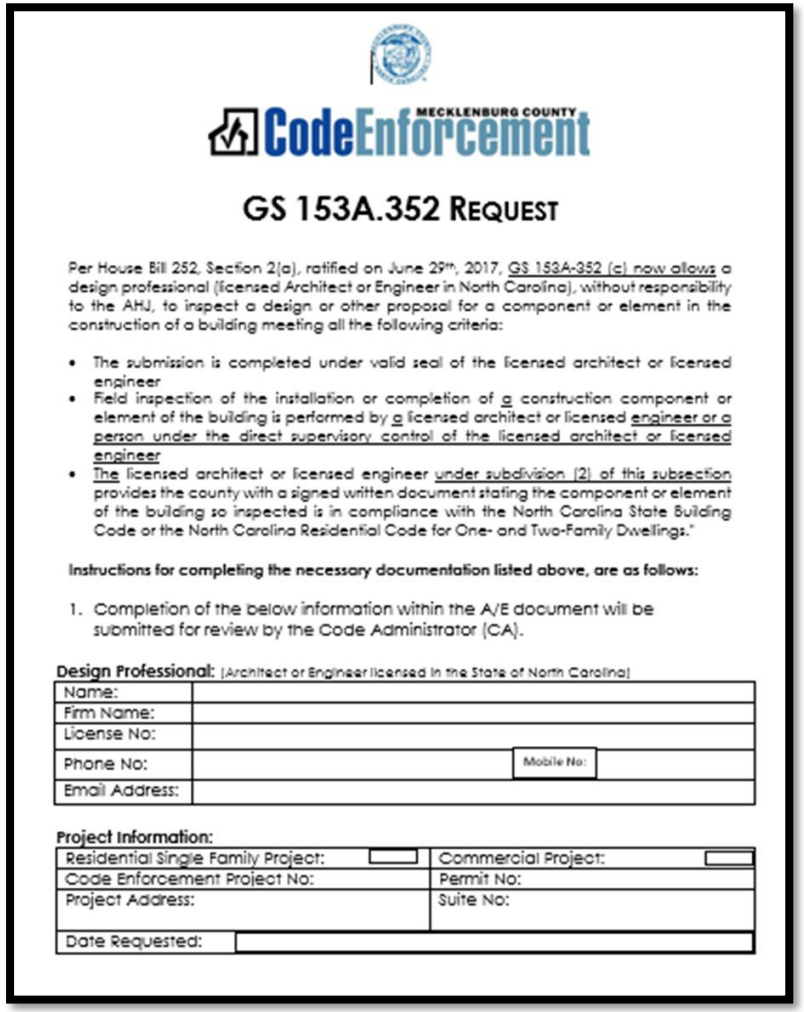
- Submission of the form & letter will generate an email to the GC and to the inspector. The email to the GC serves as the required "receipt."

Inspector

- Reviews the form and letter for completeness and if it is satisfactory, results the open inspection.

Forms Developed to Guide Each Process

HB 255 / 252 Form



MECKLENBURG COUNTY CodeEnforcement

GS 153A.352 Request

Per House Bill 252, Section 2(a), ratified on June 29th, 2017, GS 153A-352 (c) now allows a design professional (licensed Architect or Engineer in North Carolina), without responsibility to the AHJ, to inspect a design or other proposal for a component or element in the construction of a building meeting all the following criteria:

- The submission is completed under valid seal of the licensed architect or licensed engineer
- Field inspection of the installation or completion of a construction component or element of the building is performed by a licensed architect or licensed engineer or a person under the direct supervisory control of the licensed architect or licensed engineer
- The licensed architect or licensed engineer under subdivision (2) of this subsection provides the county with a signed written document stating the component or element of the building so inspected is in compliance with the North Carolina State Building Code or the North Carolina Residential Code for One- and Two-Family Dwellings."

Instructions for completing the necessary documentation listed above, are as follows:

1. Completion of the below information within the A/E document will be submitted for review by the Code Administrator (CA).

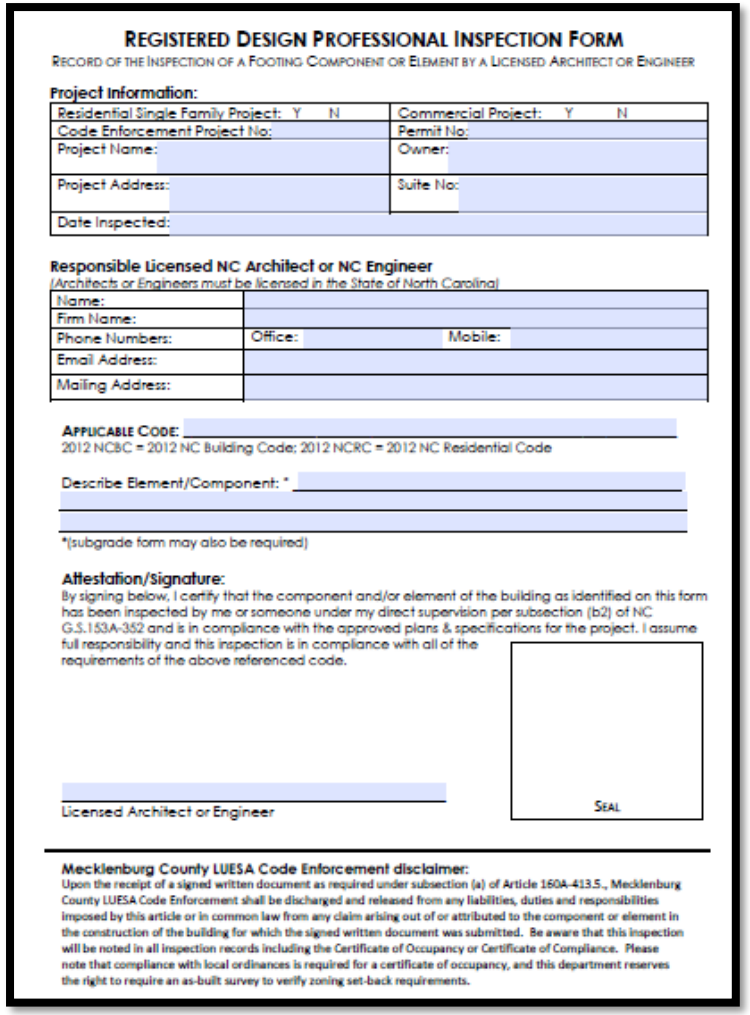
Design Professional: (Architect or Engineer licensed in the State of North Carolina)

Name:	
Firm Name:	
License No:	
Phone No:	Mobile No:
Email Address:	

Project Information:

Residential Single Family Project: ☐	Commercial Project: ☐
Code Enforcement Project No:	Permit No:
Project Address:	Suite No:
Date Requested:	

HB 948 Form



Registered Design Professional Inspection Form

Record of the Inspection of a Footing Component or Element by a Licensed Architect or Engineer

Project Information:

Residential Single Family Project: Y N	Commercial Project: Y N
Code Enforcement Project No:	Permit No:
Project Name:	Owner:
Project Address:	Suite No:
Date Inspected:	

Responsible Licensed NC Architect or NC Engineer
(Architects or Engineers must be licensed in the State of North Carolina)

Name:	
Firm Name:	
Phone Numbers:	Office: Mobile:
Email Address:	
Mailing Address:	

Applicable Code: _____
2012 NCBC = 2012 NC Building Code; 2012 NCRC = 2012 NC Residential Code

Describe Element/Component: * _____

*(subgrade form may also be required)

Attestation/Signature:
By signing below, I certify that the component and/or element of the building as identified on this form has been inspected by me or someone under my direct supervision per subsection (b2) of NC G.S.153A-352 and is in compliance with the approved plans & specifications for the project. I assume full responsibility and this inspection is in compliance with all of the requirements of the above referenced code.

Licensed Architect or Engineer

Seal

Mecklenburg County LUESA Code Enforcement disclaimer:
Upon the receipt of a signed written document as required under subsection (a) of Article 160A-413.5., Mecklenburg County LUESA Code Enforcement shall be discharged and released from any liabilities, duties and responsibilities imposed by this article or in common law from any claim arising out of or attributed to the component or element in the construction of the building for which the signed written document was submitted. Be aware that this inspection will be noted in all inspection records including the Certificate of Occupancy or Certificate of Compliance. Please note that compliance with local ordinances is required for a certificate of occupancy, and this department reserves the right to require an as-built survey to verify zoning set-back requirements.

Case Study

WGPM

Code Changes and Challenges

Code issues of major impact

2018 NC Building Code

Code Changes and Challenges

Major Building Code impact issues:

- **a. Appendix B**
  1. **Life Safety plan**
  2. **Minimum Submittal Guidelines**
- **b. Energy Code changes**
- **c. Special Inspections**

2018 Appendix B

- **Why is it called Appendix B?**
  - **Appendix B to 2018 NCACP**
- **Mandatory for all jurisdictions**
- **Cannot be changed without permission from the Building Code Council**
- **Reduced down to nine sheets instead of twelve**
  - Assumes the "missing" information will be supplied on other plan sheets
  - Requires more communication through other means now

https://codes.iccsafe.org/content/NCAPC2018

Where can I find a copy?

- **Office of State Fire Marshal**
  - OSFM / Engineering and Codes Division / Code Enforcement Resources / Design Tools
  - OSFM / Engineering and Codes Division / State Building Codes / Resources / codes.iccsafe map / NC / 2018 NCACAP
- **Mecklenburg County Code Enforcement**
  - Mecklenburg County NC / LUESA / Code Enforcement / Customer Tools / Forms

Some Areas Have Been Expanded While Others Have Been Greatly Reduced

2018 NC BUILDING CODE: ❑ **New Building** ❑ Shell/Core ❑ 1st Time Interior Completions
❑ Addition ❑ Phased Construction—Shell Core

2018 NC EXISTING BUILDING CODE: ❑ Prescriptive ❑ Alteration Level I ❑ Historic Property
(check all that apply) ❑ Repair ❑ Alteration Level II ❑ Change of Use
❑ Chapter 14 ❑ Alteration Level III

CONSTRUCTED: (date) _____ **CURRENT USE(S)** (Ch. 3): _____
RENOVATED: (date) _____ **PROPOSED USE(S)** (Ch. 3): _____

OCCUPANCY CATEGORY (Table 1604.5): Current: _____ Proposed: _____

BASIC BUILDING DATA

Construction Type: ❑ I-A ❑ II-A ❑ III-A ❑ IV ❑ V-A
(check all that apply) ❑ I-B ❑ II-B ❑ III-B ❑ V-B

Sprinklers: ❑ No ❑ Partial ❑ NFPA 13 ❑ NFPA 13R ❑ NFPA 13D

Standpipes: ❑ No Class ❑ I ❑ II ❑ III ❑ Wet ❑ Dry

Primary Fire District: ❑ No ❑ Yes **Flood Hazard Area:** ❑ No ❑ Yes

Special Inspections Required: ❑ No ❑ Yes

GROSS BUILDING AREA TABLE

LIFE SAFETY PLAN REQUIREMENTS

Life Safety Plan Sheet #: _____

- ❑Fire and/or smoke rated wall locations (Chapter 7)
- ❑Assumed and real property line locations (if not on the site plan)
- ❑Exterior wall opening area with respect to distance to assumed property lines (705.8)
- ❑Occupancy Use for each area as it relates to occupant load calculation (Table 1004.1.2)
- ❑Occupant loads for each area
- ❑Exit access travel distances (1017)
- ❑Common path of travel distances [Tables 1006.2.1 & 1006.3.2(1)]
- ❑Dead end lengths (1020.4)
- ❑Clear exit widths for each exit door
- ❑Maximum calculated occupant load capacity each exit door can accommodate based on egress width (1005.3)
- ❑Actual occupant load for each exit door
- ❑A separate schematic plan indicating where fire rated floor/ceiling and/or roof structure is provided for purposes of occupancy separation
- ❑Location of doors with panic hardware (1010.1.10)
- ❑Location of doors with delayed egress locks and the amount of delay (1010.1.9.7)
- ❑Location of doors with electromagnetic egress locks (1010.1.9.9)
- ❑Location of doors equipped with hold-open devices
- ❑Location of emergency escape windows (1030)
- ❑The square footage of each fire area (202)
- ❑The square footage of each smoke compartment for Occupancy Classification I-2 (407.5)
- ❑Note any code exceptions or table notes that may have been utilized regarding the items above

Must be filled out completely!

LIFE SAFETY PLAN REQUIREMENTS

LIFE SAFETY PLAN REQUIREMENTS

Life Safety Plan Sheet #: **L-1**

- ☒ Fire and/or smoke rated wall locations (Chapter 7)
- ☒ Assumed and real property line locations
- ☒ Exterior wall opening area with respect to distance to assumed property lines (705.8)
- ☐ Existing structures within 30' of the proposed building (see Note 1 below)
- ☒ Occupancy types for each area as it relates to occupant load calculation (Table 1004.1.1)
- ☒ Occupant loads for each area
- ☒ Exit access travel distances (1016)
- ☒ Common path of travel distances (1014.3 & 1028.8)
- ☒ Dead end lengths (1018.4)
- ☒ Clear exit widths for each exit door
- ☒ Maximum calculated occupant load capacity each exit door can accommodate based on egress width (1005.1)
- ☒ Actual occupant load for each exit door
- ☐ A separate schematic plan indicating where fire rated floor/ceiling and/or roof structure is provided for purposes of occupancy separation (N/A)
- ☐ Location of doors with panic hardware (1008.1.10) (N/A)
- ☐ Location of doors with delayed egress locks and the amount of delay (1008.1.9.7) (N/A)
- ☐ Location of doors with electromagnetic egress locks (1008.1.9.8) (N/A)
- ☒ Location of doors equipped with hold-open devices
- ☐ Location of emergency escape windows (1029) (N/A)
- ☒ The square footage of each fire area (902)
- ☐ The square footage of each smoke compartment (407.4) (N/A)
- ☒ Note any code exceptions or table notes that may have been utilized regarding the items above (N/A)

Note 1: There are no structures within 30' of this building.

Just add a note under the table

"Not Applicable" is an acceptable answer

LIFE SAFETY PLAN REQUIREMENTS

Life Safety Plan Sheet #: _____

- ☐ Fire and/or smoke rated wall locations (Chapter 7)
- ☐ Assumed and real property line locations
- ☐ Exterior wall opening area with respect to distance to assumed property lines (705.8)
- ☐ Existing structures within 30' of the proposed building
- ☐ Occupancy types for each area as it relates to occupant load calculation (Table 1004.1.1)
- ☐ Occupant loads for each area
- ☐ Exit access travel distances (1016)
- ☐ Common path of travel distances (1014.3 & 1028.8)
- ☐ Dead end lengths (1018.4)
- ☐ Clear exit widths for each exit door
- ☐ Maximum calculated occupant load capacity each exit door can accommodate based on egress width (1005.1)
- ☐ Actual occupant load for each exit door
- ☐ A separate schematic plan indicating where fire rated floor/ceiling and/or roof structure is provided for purposes of occupancy separation
- ☐ Location of doors with panic hardware (1008.1.10)
- ☐ Location of doors with delayed egress locks and the amount of delay (1008.1.9.7)
- ☐ Location of doors with electromagnetic egress locks (1008.1.9.8)
- ☐ Location of doors equipped with hold-open devices
- ☐ Location of emergency escape windows (1029)
- ☐ The square footage of each fire area (902)
- ☐ The square footage of each smoke compartment (407.4)
- ☐ Note any code exceptions or table notes that may have been utilized regarding the items above

ACCESSIBLE DWELLING UNITS
(SECTION 1107)

TOTAL UNITS	ACCESSIBLE UNITS REQUIRED	ACCESSIBLE UNITS PROVIDED	TYPE A UNITS REQUIRED	TYPE A UNITS PROVIDED	TYPE B UNITS REQUIRED	TYPE B UNITS PROVIDED	TOTAL ACCESSIBLE UNITS PROVIDED

ACCESSIBLE PARKING
(SECTION 1106)

LOT OR PARKING AREA	TOTAL # OF PARKING SPACES		# OF ACCESSIBLE SPACES PROVIDED			TOTAL # ACCESSIBLE PROVIDED
	REQUIRED	PROVIDED	REGULAR WITH 5' ACCESS AISLE	VAN SPACES WITH 132" ACCESS AISLE	VAN SPACES WITH 8' ACCESS AISLE	
TOTAL						

Plans Submittal Requirements for Commercial Projects

Plan Submittal Requirements

Special Inspections

- When do Special Inspections apply?
- Are there any new Special Inspections?
- Who is an “Approved Agency”?

Scoping for Special Inspections

1705.1.2 Specific elements always requiring special inspections. *Special inspections* in accordance with Sections 1704 and 1705 are required for the following elements only, regardless of the building or structure that they are in:

1. Piles, piers and special foundations in accordance with Sections 1705.7, 1705.8, 1705.9, 1810.3.5.2.4 and 1810.3.5.2.5;
2. Sprayed fire-resistant materials in accordance with Section 1705.14;
3. Mastic and intumescent fire-resistant coatings in accordance with Section 1705.15;
4. Smoke control and smoke exhaust systems in accordance with Sections 1705.18;
5. Retaining walls and retaining systems exceeding 5 feet (1524 mm) of unbalanced backfill height in accordance with Section 1807.2.

Special inspections are not required for other elements unless the building or structure is one identified in Section 1705.1.3.

1705.1.3 Structures requiring special inspections. *Special inspections* in accordance with Sections 1704 and 1705 are required for the building, building components or other structures according to the following:

1. Buildings or other structures listed in Table 1604.5 in Risk Category II if:
   - 1.1. Building height exceeds 45 feet (13.7 m) or three *stories*; or
   - 1.2. The building is an underground building in accordance with Section 405.1.
2. Buildings or other structures listed in Table 1604.5 in Risk Categories III or IV.

Additional Qualifiers for SI

1705.11 Wind Resistance –

- Unless exempted by the exceptions to 1704.2, special inspections for Wind-resistance are only required for buildings and structures:
- In wind exposure category B, where V_{asd} as determined in accordance with Section 1609.3.1 is 120 mph or greater;
- In wind exposure category C or D, where V_{asd} as determined in accordance with Section 1609.3.1 is 110 mph or greater.

- https://www.youtube.com/watch?v=xS4kTWDeHOY

1705.12 & 1705.13 Seismic force- resisting systems

- **Seismic Design Categories B, C, D, E or F:**
  - Structural steel
  - Structural steel elements other than those in 1705.12.1.1
  - Seismic isolation systems
  - Nondestructive testing of structural steel
  - Nondestructive testing of structural steel elements other than those in 1705.13.1.1
- **Seismic Design Categories C, D, E or F:**
  - Designated seismic systems
  - Anchorage of electrical equipment for emergency and standby power
  - Installation and anchorage of piping systems for Hazardous materials and associated mechanical units
  - Installation and anchorage of ductwork for Hazardous materials
  - Installation and anchorage of vibration isolation systems where the required clearance is ≤ 1/4" between the equipment support frame and restraint
- **Seismic Design Categories D, E or F:**
  - Architectural components
  - Access floors
  - Storage racks ≥ 8' in height
  - Cold-formed steel special bolted moment frames
- **Seismic Design Categories E or F:**
  - Anchorage of other electrical equipment

New SI for Specific Buildings

[BF] 1705.17 Fire-resistant penetrations and joints. In *high-rise buildings* or in buildings assigned to *Risk Category* III or IV, *special inspections* for *through-penetrations*, membrane penetration firestops, *fire-resistant joint systems* and perimeter fire barrier systems that are tested and *listed* in accordance with Sections 714.3.1.2, 714.4.2, 715.3 and 715.4 shall be in accordance with Section 1705.17.1 or 1705.17.2.

[BF] 1705.17.1 Penetration firestops. Inspections of penetration firestop systems that are tested and *listed* in accordance with Sections 714.3.1.2 and 714.4.2 shall be conducted by an *approved agency* in accordance with ASTM E2174.

[BF] 1705.17.2 Fire-resistant joint systems. Inspection of fire-resistant joint systems that are tested and *listed* in accordance with Sections 715.3 and 715.4 shall be conducted by an *approved agency* in accordance with ASTM E2393.

Approved Agency

1703.1 Approved agency. An approved agency shall provide all information as necessary for the *building official* to determine that the agency meets the applicable requirements specified in Sections 1703.1.1 through 1703.1.3.

- This section specifies the information that an approved agency must provide to the building official to enable him or her to determine whether the agency and its personnel have the requisite qualifications to provide adequate quality control.

1703.1.1 Independence. An *approved agency* shall be objective, competent and independent from the contractor responsible for the work being inspected. The agency shall also disclose to the *building official* and the *registered design professional in responsible charge* possible conflicts of intere0st so that objectivity can be confirmed.

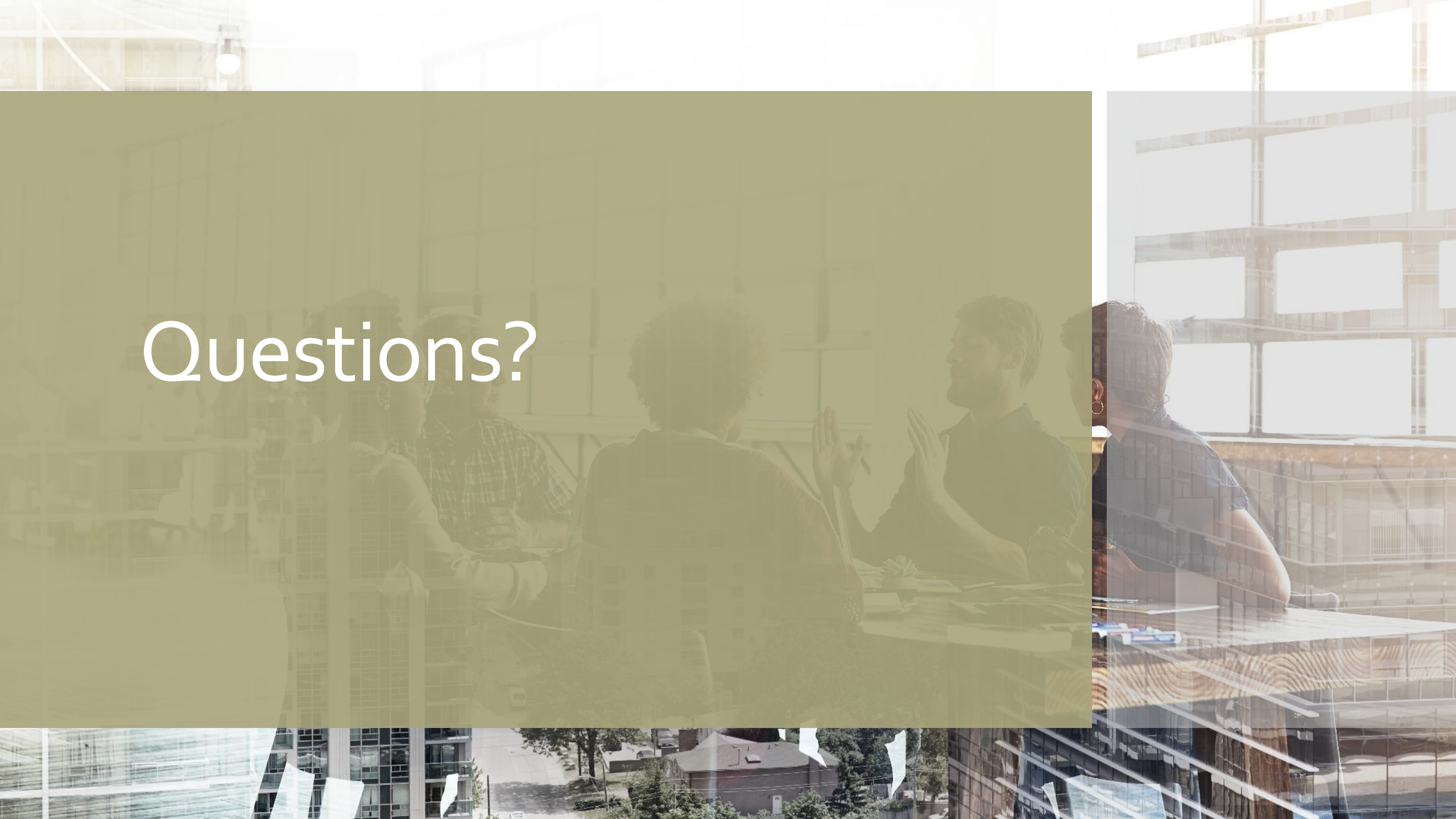
- As part of the basis for a building official's approval of a particular inspection agency, the agency must demonstrate its competence and objectivity. The competence of the agency is judged by its experience and organization, and the experience of its personnel. To

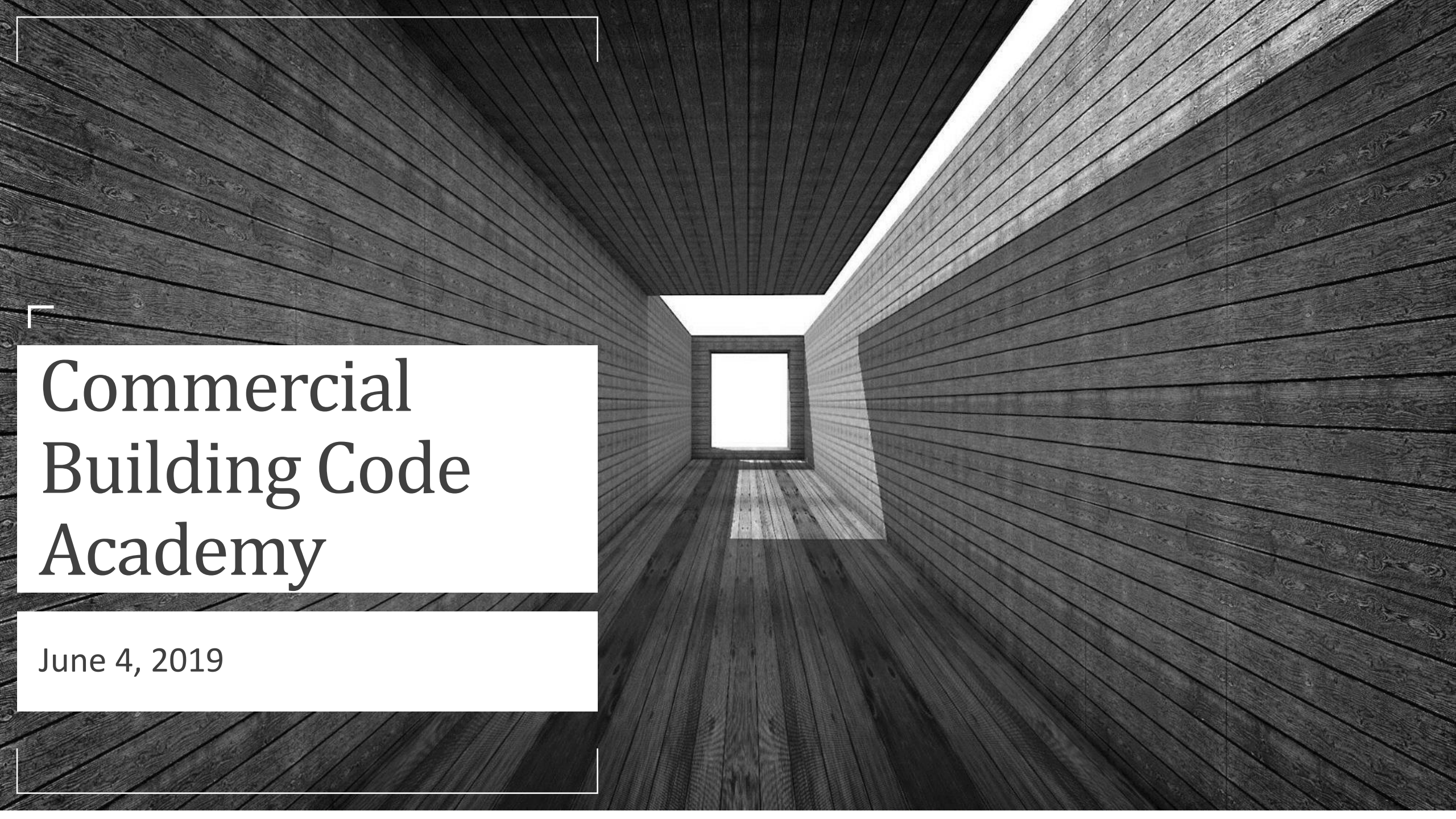
[A] APPROVED AGENCY. An established and recognized agency that is regularly engaged in conducting tests or furnishing inspection services, where such agency has been *approved* by the *building official*.

- Third-party testing or inspections may be needed for elements within the built environment. The basis for the building official's approval of any agency for a particular activity may include, but is not necessarily limited to, the capacity and capability of the agency to perform the work in accordance with Section 1705 and other applicable sections. This is typically done through a review of the résumés and references of the agency and its personnel. For this code, the building official is identified as the person responsible for approval.

Historically referred to as a Special Inspection Firm (SIF)

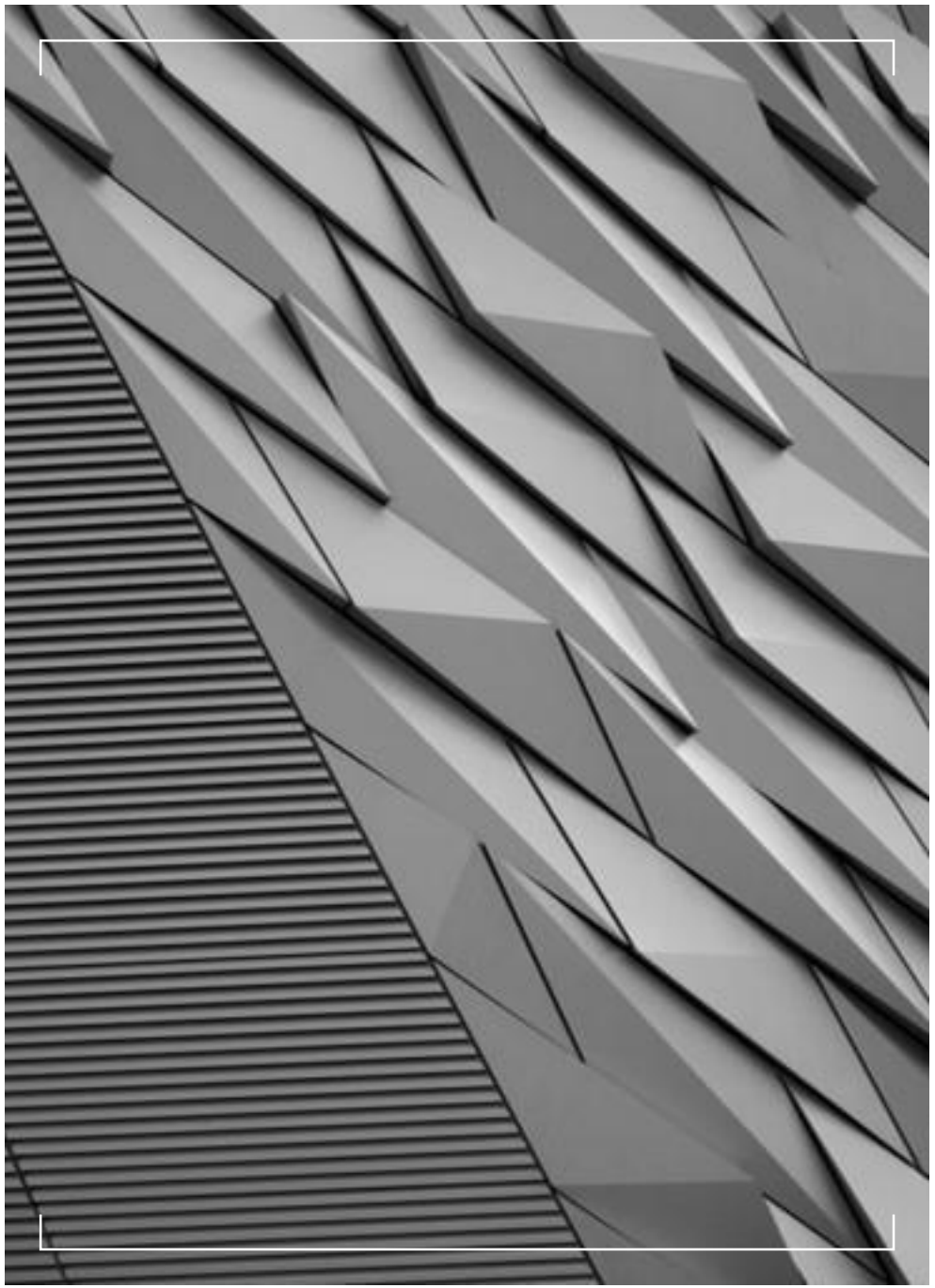
Questions?





Commercial Building Code Academy

June 4, 2019



ISO

Our appeal was successful so ISO is still applicable for FY20

Technical

60 hours required

Legal

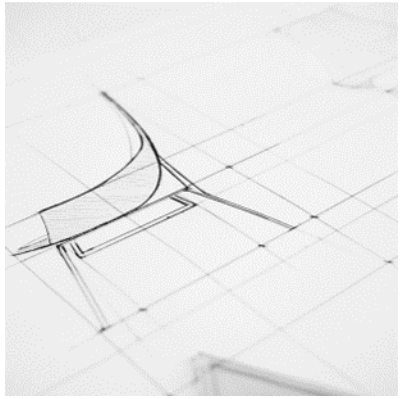
12 hours required

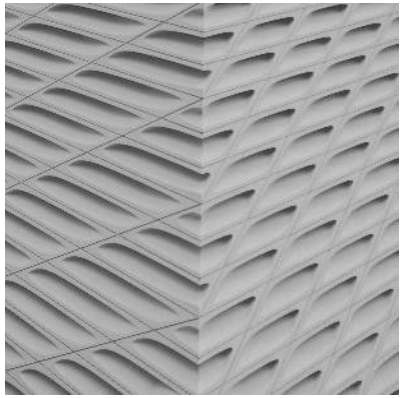
Mentoring

12 hours required

Legal Classes for FY20 will be scheduled during the following months:

- September
- October
- November
- December





Legal Classes

We were asked to move the legal classes away from Jan, Feb & Mar to avoid conflict with the NCBIA Winter Code Seminars.

After these introductory slides, the rest of the meeting was conducted by National Gypsum, who shared some of the new rated assemblies they have in their arsenal. Also, after the meeting, Amanda Keske gave the plans examiners an in-depth training on Arcades.

COMMERCIAL BUILDING CODE ACADEMY

JULY 2, 2019

THIS MEETING WAS CANCELLED DUE TO A SCHEDULING CONFLICT

August 6, 2019

Commercial Building Code Academy

This meeting had two presenters - Tom Hayward of Saftifirst gave a presentation on *Fire-Protective versus Fire-Resistant Glazing* for the first 1.5 hours. Paul Coats, PE, from AWC presented CE session CS4158 *Mass Timber & Changes to Chapter 23* for the balance of the time. PPT's may be made available by contacting Jeff Vernon.

COMMERCIAL BUILDING CODE ACADEMY

September 5, 2019 (one time change of date due to Labor Day holiday)

Joseph Hauf, PE, from ConQuest-Firespray presented CE class CS4228 *Fire-rated Ducts, Enclosures and Smoke Control* for the full 4 hours.